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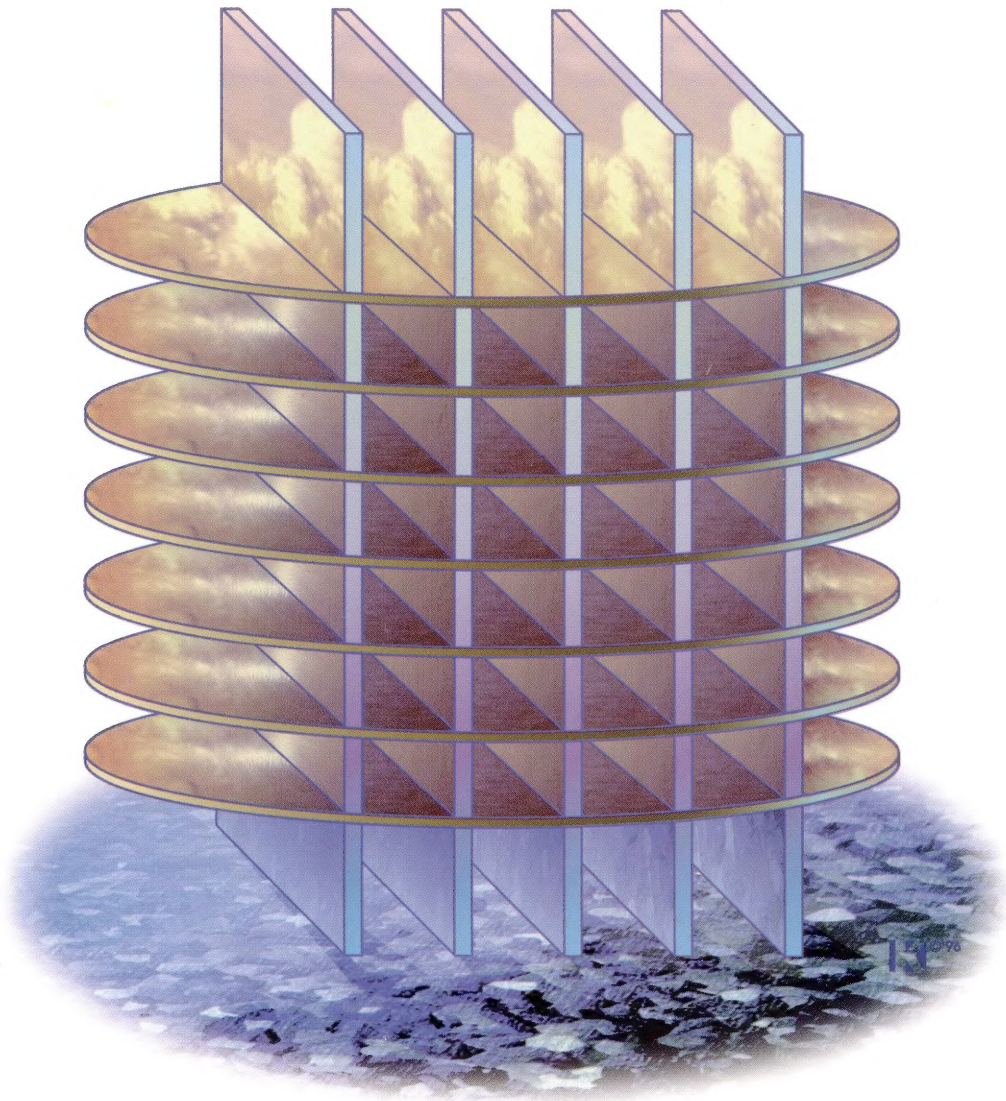
Hands-On Solutions for HP-UX Users • September 1996



An Introduction to the Logical Volume Manager for HP-UX

Upgrading from HP-UX 9.x to HP-UX 10.x–It's All in the Process

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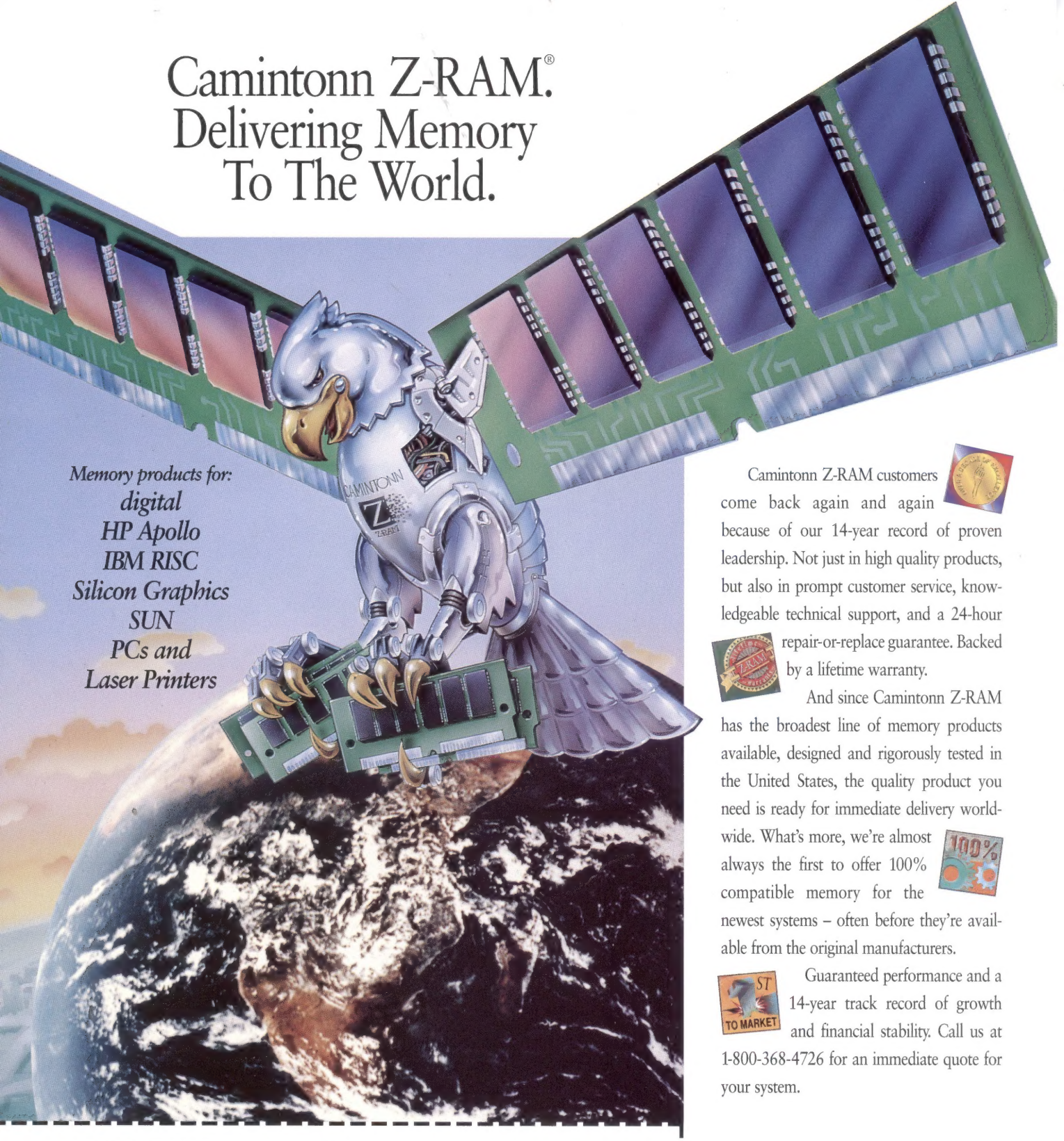

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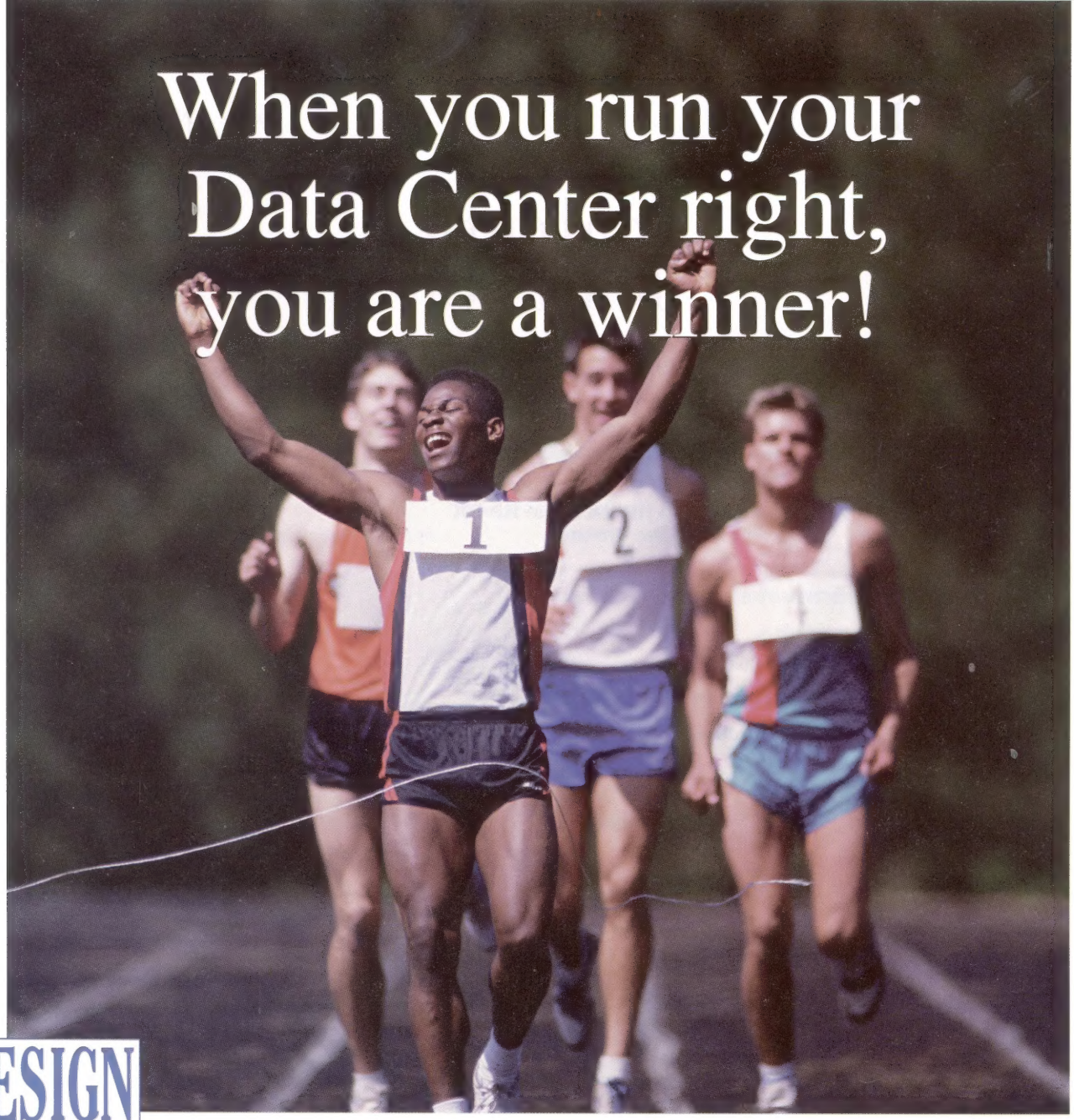

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hp·ux/usr

Volume 4, Number 5 September 1996

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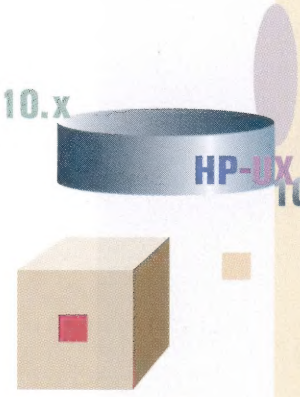

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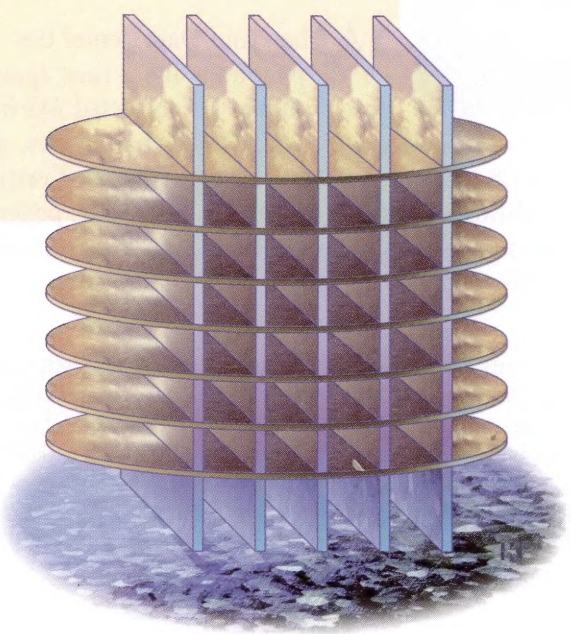

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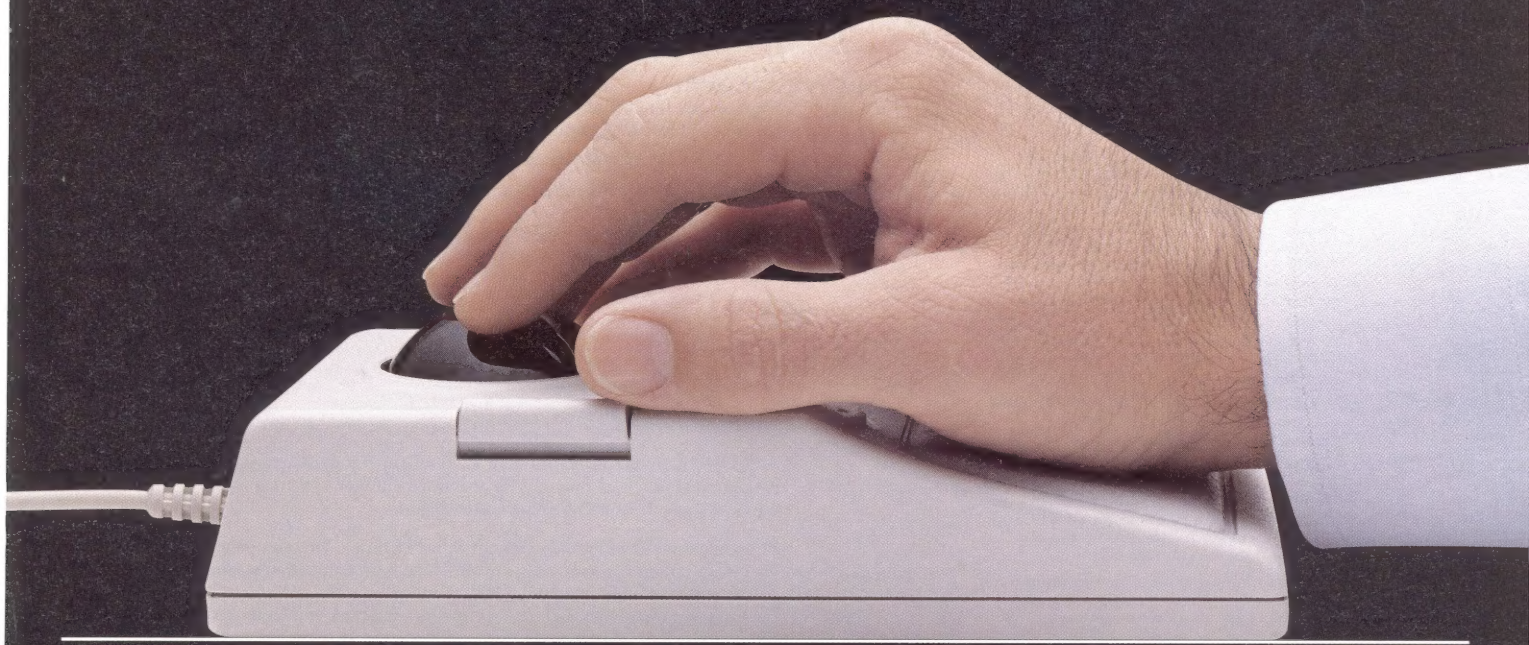

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CIRCLE 117 ON READER SERVICE CARD

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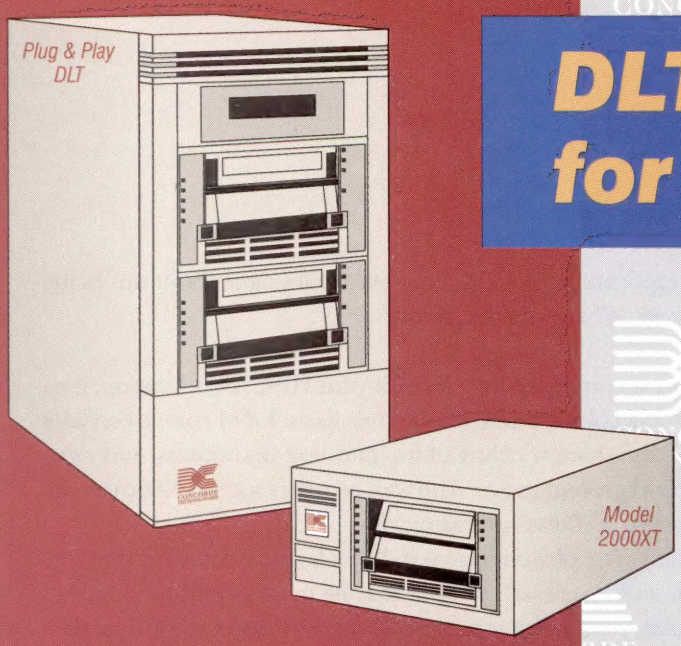

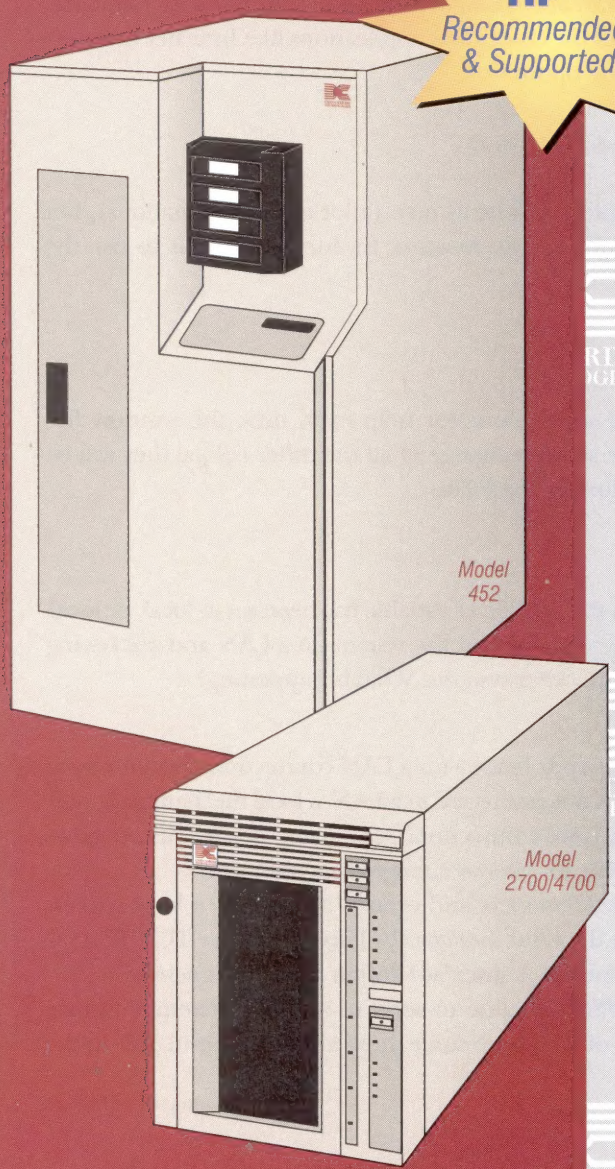

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CIRCLE 113 ON READER SERVICE CARD

Question & Answer

Q: When I run some applications in VUE, I get error messages about not being able to allocate a color map. What does this mean?

A: Unless you ordered a special video interface for your HP-UX workstation, your video card likely has only 256 colors. While 256 sounds like a lot of colors, consider the colors of your frames, the shadow colors of top and bottom buttons, and especially the colors used by a background image. And with browsers such as Netscape, displaying a nice picture can use up these colors quickly.

There is no easy solution. The obvious one is to buy a larger video card that supports 24-bit color (i.e., 16 million colors), but this may be more expensive than you wish. Another is to simplify your color screen. You can start by configuring your VUE or CDE screen with the low color setting in your config files. Another alternative is to switch from VUE/CDE to mwm (Motif Window Manager), although this will require reading up on how to start and configure the same features as VUE or CDE.

Another way is to suppress all the colors that applications like Internet browsers might use. For Netscape, use the option:

```
netscape -xrm 'Netscape*maxImageColors:48'
```

or similar command. The colors won't be as nice (a lot of approximations), but at least the other programs will survive. Another fix for Netscape is to use the private color map option:

```
netscape -install
```

which allows Netscape to use a private color map each time the window has focus. Don't be alarmed at the sudden change of all the other colors; they will be set right when Netscape is no longer the focus.

Q: I have a situation in which the *$DISPLAY* variable has been set to local, or localhost as in `DISPLAY=localhost:0.0`. We put the system on a LAN and are having problems receiving displays from other systems. What is happening?

A: The X Window System depends heavily on a LAN connection, even for local displays. So when a workstation is not connected to a LAN, a local mechanism is available to pretend that there is a LAN connection. Also, using this *$DISPLAY* value can reduce the actual LAN traffic for display changes that are local.

The *$DISPLAY* value for *local:0, unix:0,* and even *:0* all refer to a local sockets communication method, while the value *localhost:0* will use the entire TCP/IP stack but actually loop through the loopback interface (often seen in *.etc.hosts*).

If you obtain the local *$DISPLAY* value to send to another system, you may want to verify that it is not one of the above since these are meaningful only in the local machine.

Continued on Page 10

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CIRCLE 77 ON READER SERVICE CARD

Q: A new JetDirect card was configured by a Novell server and TCP/IP connections were disabled. Now the card needs to be used in a TCP/IP environment and a Novell server is not available. What can be done?

A: You should be able to telnet to the card. The default TCP/IP address will be 192.0.0.192 (for newer model cards such as J2550A). To make sure you are connected to the card, type `?` and Return, which then should display the card's settings. To reset the card to factory defaults, type the command

```
cold-reset
```

and then Return. The card should ask you to type `quit` and Return, at which point the card will be reset. Power cycle the printer/plotter and the card should be reenabled for all protocols.

Q: How can I place a set of patches into a single package so I can update the patches at one time?

A: To set up a *netdist* server for version 7.x, 8.x, or 9.x software, there are two set-up procedures. A *netdist* server can contain multiple versions of the software (e.g., 8.02, 8.07, 9.01, 9.04) as well as different platforms. This is also an easy way to create patch bundles so that a single run of *update* will load many patches at the same time.

Procedure 1: Load the repository

```
updist -s /dev/rmt/0m -d /patches/700 -S 700 PHxx_####
```

where:

`-s /dev/rmt/0m` = whatever tape device you use
or `-s /mountpoint -C code` for a mounted CD-ROM
`-C codeword -s /tmp/PHxx_xxxx.updt` for a file as the source
`-s host -P port` for another *netdist* server and port ####

`-d /patches/700` = the repository on the local machine
`-S 700` = Series 700, 800, or 300 (and 400)
`PHxx_####` = the file set(s) to be loaded. For a patch, there is usually just one file set, which is the name of the patch. If there are multiple file sets within the source media, they can be explicitly named; to select all file sets, use "*" as the selector.

Procedure 2: Start the* netdistd *daemon

To set up the *netdist* server once *updist* has created the repository:

```
netdistd -P 2905 -l -c /tmp -f /patches700/MAIN.pkg
```

where:

`-P 2905` = a port number to identify this specific repository (multiple repositories can sit on the same machine with different ports pointing to different directories)
`-l` = optional login to keep track of usage of this port in a log file.
`-c /tmp` = optional location for temp files used by the *netdistd* program; default is the same directory as the repository
`-f /patches700/MAIN.pkg` = the repository location. *MAIN.pkg* is created from *updist* as an index

The *netdistd* program is a daemon and many copies of the daemon can be running at the same time to allow serving multiple packages, whether they be patches or versions of the software (9.03, 9.04, 9.05, etc.) or even different platforms (300, 700, or 800). We have a central system that provides *netdistd* services with more than a dozen versions and platforms represented, and start all the *netdistd* daemons from */etc/rc*.

Problems:

***netdistd* does not stay running**

To debug *netdistd* startup problems, turn on logging with either *-L* or *-l* and check the log file */usr/adm/netdistd.log* (the default log file). Problems are usually related to permissions on the directories for the packages, or access to the temp directory (*-c* option). Be careful that the temp directory has write permission; a common error is not to specify *-c* and default to using the directory with the *netdist* info, which has been mounted as read-only.

Also, make sure that the path names in *MAIN.pkg* match the mountpoint in use for the *netdist* files. It is common to move *netdist* directories and forget to edit the *MAIN.pkg* file manually.

Doing the update from a netdist server

Now to perform an update, on the remote machine you would:

```
update -P 2905 -s myserver -c
```

which produces a list of the file sets available from the port 2905 located on machine myserver.

```
update -P 2905 -s myserver PHxx_#### {PHxx_#### PHxx_####...}
```

which will load the specified file set(s) from port 2905 on the machine *myserver*. Any number of file set names found within the repository can be specified. However, each file set must be named explicitly...there is no wildcard capability.

Of course, *update* may be run interactively to select the server and the file sets. And to 'push' an update from a central location, you could:

```
remsh myremote update -P 2905 -s myserver PHxx_####
```

Another method is to use cron on each remote system to pull a list of commands to execute from a central server, i.e., a file with a series of *update* commands. The format would be a script in the form:

```
update -P 2905 -s myserver PHNE_5940
update -P 2904 -s myserver LP-SPOOLER
update -P 2967 -s myserver C-MIN
```

Q: What are the 9144/9145 tape formats?

A: There are a number of formats employing seemingly identical 1/4-inch cartridges. The most common are the various QIC definitions (QIC = Quarter Inch Committee). Sun and Apollo systems, for example, often use QIC-24 (60 MB). Traditional HP drives do not use the QIC format, but rather one invented by 3M some five years before QIC. It is called HCD format.

Inserting an HP cartridge in a QIC drive leads at the very least to frustration, and potentially to permanent damage to the HP tape.

The One-Minute Summary

Attempting to use a QIC tape in an HP HCD drive results in:

1. Tape rejected.
2. Possible tape unspool after repeated attempts.

Attempting to use an HCD tape in a QIC drive results in:

1. No data exchanged.
2. An apparently damaged tape (rewind scenario).
3. A probably destroyed tape using manual reposition (spill scenario).
4. A definitely destroyed tape (write scenario).
(scenarios described below)

As you can see in *Table 1*, HCD has some advantages. Errors missed by read-after-write may still be corrected by ECC when read later. Tapes may be "certified" and recertified by end users, sparing bad blocks. The random-access capability allows software to treat the tape like a *very* slow disk drive.

Disk-image cartridge tape backups are mountable as read/write volumes, and may be used as any other disk. Random access is possible because the location of every record can be calculated because of the preformatting. HCD and QIC cartridges are mechanically identical. An HCD cartridge will fit in a QIC drive, and vice versa.

So what is the problem?

- HCD tapes are preformatted by 3M or a 3M licensee. A full-track factory write head lays down fixed physical records on the tape. No HCD drive ever writes on these record headers (called "keys"), only in between them. HP *format* and/or *mediainit*

New kids on the block...

"I bet there's a whole bunch of ads in this magazine for **tape libraries**. But you won't want to miss what my dad has to say, 'cuz his SL-400's really neat—it's easy to use, it won't break, and you can even buy it from him, too."

CIRCLE 103 ON READER SERVICE CARD

TABLE 1
CARTRIDGE TAPE SPECIFICATION OVERVIEW

CHARACTERISTIC	HCD CARTRIDGE TAPE	QIC CARTRIDGE TAPE
Approx. Incep. Date	1980	1985
Drive Hardware	9144A, 35401A, 9145A	various
Mechanical form factor	3M DC150 and DC600	3M DC150 and DC600
Merchandising name	Cartridge tape, CTD	QIC-24 or QIC-120
Typical supplier	HP (for HP customers)	any media vendor
Generic designation	DC600HC, DC615HC, DC600XTD, DC615XTD	DC600A, DC615A
Tape pre-format	Full-track 3M HCD-75 or modified HCD-134	<none>
Data format	MFM	NRZI
EOT/BOT	Delimited by pre-format	Optical tape sense holes
Rewind position	Right spool empty	Left spool empty
Capacity	67 or 134 MB 16 or 32 MB for short tapes	60 or 120 MB
Number of tracks	16 or 32	9 or 15
Access types	Random (re-writeable) or serial	Serial only
Average seek (60M)	2 minutes	20 minutes
" " (15M)	30 seconds	5 minutes
Error control	Read-while-write plus ECC	Read-while-write only

user processes merely "certify," performing read/write tests, sparing bad blocks, and updating logs, similar to a hard disk.

The read/write heads in the drives are either 1/16- or 1/32-track. Keys (which are full-track) cannot be rewritten in the field.

- The keys also do not extend to the physical BOT/EOT sense holes in the tape. When the first HP drives were developed in the early 1980s, optical sensing was deemed too unreliable, so all HP drives use boundary keys to denote BOT/EOT. QIC tapes are more like traditional 1/2-inch 9-track media. The tapes have no preformatting, so QIC drives must rely on the sense holes for BOT/EOT.
- If you put a QIC tape (blank or written) in an HP HCD drive, the HP drive will search (in the wrong way, past EOT for QIC tapes) for the nearest key, fail to find one, time-out, buzz, release (unload) the tape and illuminate the FAULT indicator. No data lost, but no data is read or written either. Repeated attempts risk a tape spill.
- If you put an HCD tape in a QIC drive, the drive will "rewind" it (to the wrong end of the tape by HP conventions) and OUTSIDE the keys region.

Suppose the tape is removed from the QIC drive and

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reinserted in an HP drive. The HP drive, as in the preceding example, will search for a key (again, in the wrong direction because of the QIC rewind), not find a key in a reasonable time, and reject the tape for fear of spilling tape if the search continues. It will buzz, release, and FAULT. Repeated attempts risk a tape runoff.

- The tape can be MANUALLY wound, in the COUNTER-INTUITIVE direction, to reposition it inside the keys. If reinserted in the HP drive, it will properly load (after adding an extra minute to the load time because it was rewound to the wrong end).
- If, on the other hand, the HCD tape was left in the QIC drive, two more scenarios obtain. The QIC drive has no clue that this is an HCD tape.
  1. The HCD data structures just look like noise. Any attempt to read an HCD tape simply fails or returns garbage data. If the tape is removed after a read attempt, the rewind scenario above prevails.
  2. A QIC drive will happily WRITE on an HCD tape. This destroys both existing data *and* the HCD preformatting keys. If the preformatting is ever lost, the tape can *never* be used in an HCD drive again. (This problem can also happen after degaussing an HCD tape.)

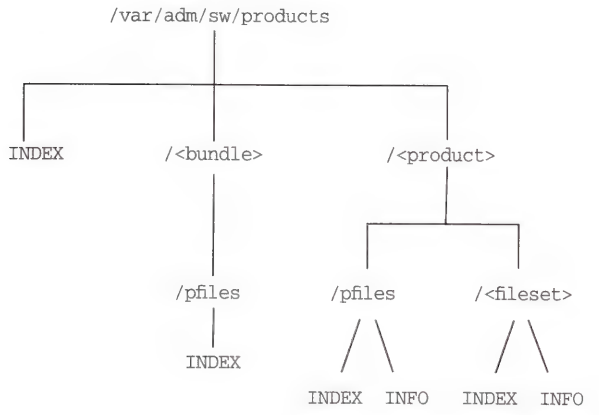
Q: I have just upgraded my 712 from HP-UX 9.03 to 10.01. Previously, I could find file set information under */system*. Where is this information at 10.01?

A: At 9.X, *update*(1M) used the file set information under */system*. At 10.X, the product Software Distributor was introduced. SD uses what we call the installed products database, or IPD. This information resides under */var/adm/sw/products*. In the hierarchy under this directory are several files called *INDEX*. These files make up the IPD. *swlist*(1M) uses the IPD to display information.

Software is distributed either in bundles of products or just as individual products. The directory structure reflects this.

Continued on Page 14

There is a directory for every bundle installed on the system. The product directories are not under the bundle directory because a product can be in more than one bundle. So, the product directories are immediately under */var/adm/sw/products*. An *INDEX* file exists under the directory structure for both the bundle and product directories. There is also a main *INDEX* file directly underneath */var/adm/sw/products* that encompasses all of the IPD information.



The *INFO* file under *<product>/pfiles* holds file attribute information regarding SD control scripts for the product. The *INFO* file under *<product>/fileset* holds file attribute information regarding the files that constitute the file set. This is analogous to */system/<fileset>/pdf*. *swverify*(1M) uses these *INFO* files to verify file attribute information such as size, ownership, and checksum.

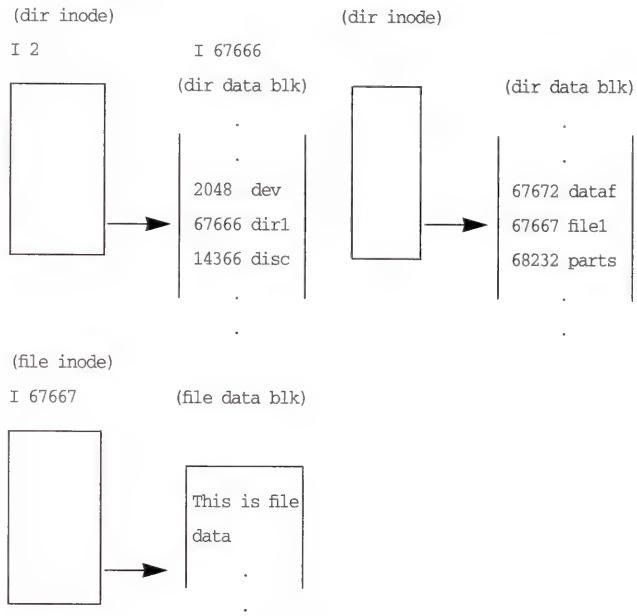
Q: What is the difference between a hard and soft link?

A: First, let's briefly discuss the file system structure. A file system consists of superblocks, inodes, and data blocks. In simple terms, every inode has data block pointers as well as other information. If the inode is associated with a regular file, the data blocks it points to contain data. If the inode is associated with a directory, the data blocks it points to do not contain file data. Instead they contain pairs of file/directory name and inode number associations.

For example, let's look at a file called */dir1/file1*.

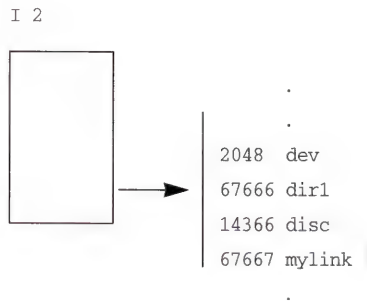
```
# ls -id /
     2 /
# ls -id /dir1
 67666 /dir1
# ls -i /dir1/file1
 67667 /dir1/file1
# cat /dir1/file1
This is file data
```

This looks like :



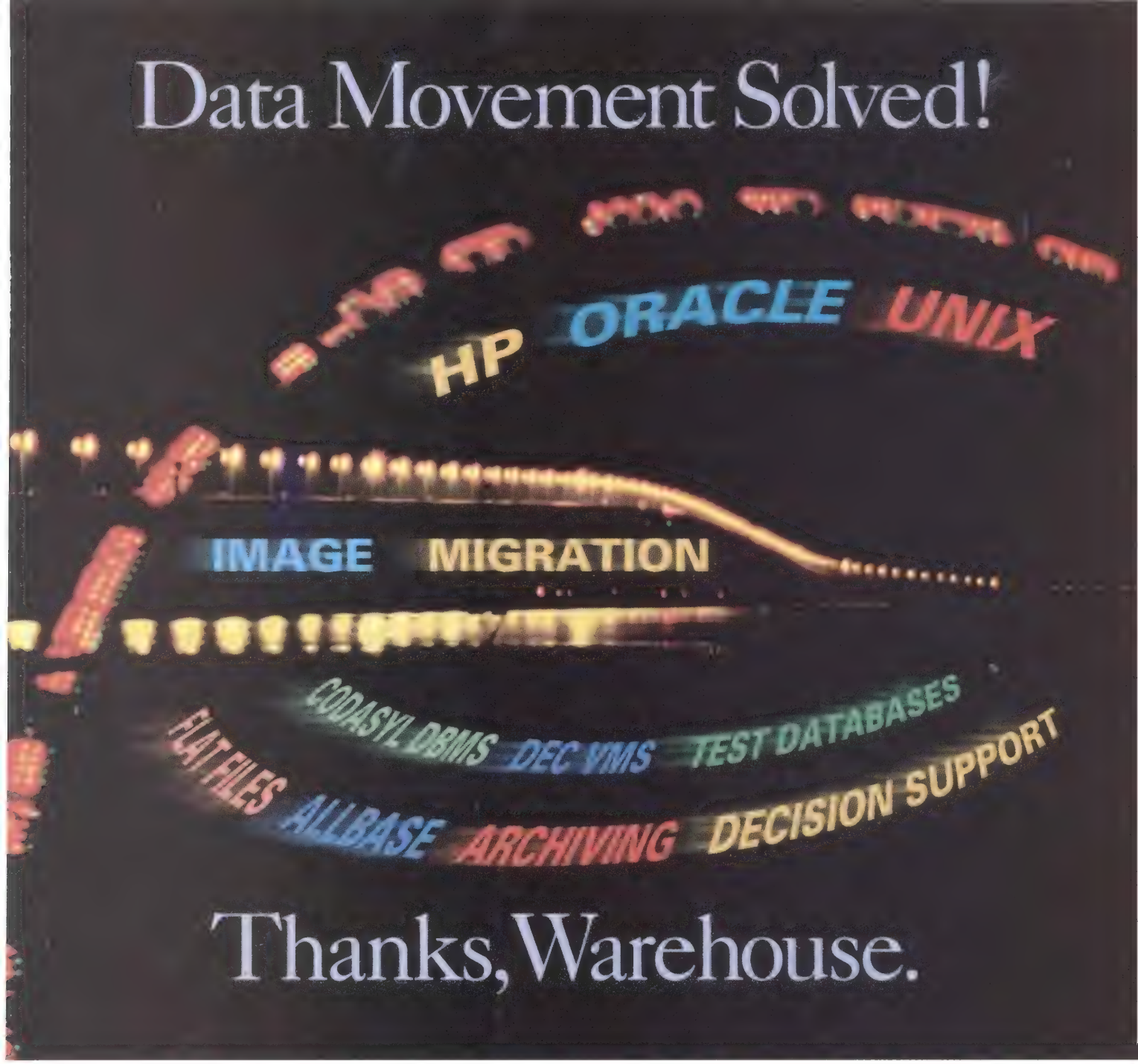
When a hard link to a file is created, a filename/inode pair is created in the proper directory data block. The inode number used is that of the existing file named in the command. Additionally, the link count is increased in the inode structure.

```
# ln /dir1/file1 /mylink
# ls -i /mylink
 67667 /mylink
```



Continued on Page 16

Data Movement Solved!



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When a soft link is created, a new inode is allocated. That inode structure will contain the file path of the target of the link. This allows for links between file systems. A hard link cannot cross file systems as inode numbers are unique only within a file system.

Q: I am going to upgrade my 735 workstation to 10.10 in the near future. What differences exist regarding kernel configuration?

A: Here are some of the differences and similarities of kernel configuration at 9.X and 10.X.

- At 9.X, the kernel is located in */hp-ux*. At 10.X, it is located in */stand/vmunix*.
- At 9.X, the kernel configuration directory is */etc/conf*. At 10.X, the directory is */stand/build*.
- At 9.X, the kernel configuration file is called *dfile* by default. At 10.X, it is called *system*.
- The format of the *system* file is very similar to the format of *dfile*.
- At 9.X, the kernel build utility is *config*(1M). At 10.X, it is *mk_kernel*(1M).
- At 9.X, *config*(1M) used */etc/master* for device information. At 10.X, *mk_kernel*(1M) uses the directory */usr/conf/master.d*. The device tables are separated into files based on application.
- At 10.X, it is possible to create a system file from a kernel on disk. The command is

```
/usr/lbin/sysadm/system_prep.
```

Q: How can I use the command *ipcs*(1) to tune interprocess communication kernel parameters?

A: The best way to tune any kernel parameter is to discuss resource needs with your application vendors. However, you can associate some fields from *ipcs*(1) with specific kernel parameters.

Message queues:

```
# ipcs -obq
IPC status from /dev/kmem as of Sun Jun 16 21:05:44 1996
T         ID     KEY            MODE      OWNER    GROUP CBYTES  QNUM QBYTES
Message Queues:
q          0 0x3c442016 -Rrw--w--w-      root     root      0     0  16384
q          1 0x3e442016 --rw-r--r--      root     root      0     0    264
```

msgmni: This parameter defines the maximum number of message queue identifiers on the system. One identifier is needed for each message queue. Each line of output represents one message queue.

msgmnb: This parameter defines the maximum number of bytes that can be queued on a single message queue. The column CBYTES shows the number of bytes currently outstanding on the queue.

Shared memory:

```
# ipcs -mb
IPC status from /dev/kmem as of Sun Jun 16 21:26:57 1996
T     ID     KEY            MODE    OWNER   GROUP      SEGSZ
Shared Memory:
m      0 0x41442050 --rw-rw-rw-    root    root        512
m      1 0x41442052 --rw-rw-rw-    root    root      14620
m      2 0x41443034 --rw-rw-rw-    root    root       8192
m    203 0x43445802 --rw-rw-rw-  daemon  daemon    5767168
```

shmmni: This parameter defines the maximum number of shared memory identifiers on the system. Each line of output represents a shared memory segment.

shmmax: This parameter defines the maximum shared memory segment size. The SEGSZ column shows the size of each segment.

Semaphores:

```
# ipcs -sb
IPC status from /dev/kmem as of Sun Jun 16 21:33:20 1996
T     ID     KEY        MODE       OWNER     GROUP  NSEMS
Semaphores:
s      0 0xffffffff --ra-------     root      root     1
s      1 0x41442052 --ra-ra-ra-     root      root     2
s      2 0x41443034 --ra-ra-ra-     root      root     2
s      3 0x01090522 --ra-r--r--     root      root     1
```

semmni: This parameter defines the maximum number of semaphore identifiers on the system. A semaphore identifier is needed for each semaphore group. Each line of output represents a semaphore group.

semmns: This parameter defines the maximum number of semaphores on the system. The column NSEMS shows the number of semaphores in each semaphore group. Add the NSEMS column to find the number of semaphores currently in use.

Q: I have a workstation running HP-UX 10.01. I would like to remove a commands patch that I had previously loaded on the system. How is this done? Also, where do the original pre-patch files reside?

A: The pre-patch files are stored under */var/adm/sw/patch.* For example, let's say that patch PHCO_7635 needs to be removed from the system. PHCO_7635 superseded PHCO_6950. That patch had been applied to the system some time before PHCO_7635.

There will be a directory for PHCO_7635 under */var/adm/sw/patch.*

```
# ls /var/adm/sw/patch/PHCO_7635
FILE_LIST    INFO    checkremove  postremove   preremove    usr
```

Under this directory will be control scripts, an *INFO* file, the directory structure for the pre-patch files, and a file called *FILE_LIST.* The control scripts (*checkremove, postremove,* and *preremove*) are executed by *swremove* during patch removal. The *INFO* file holds attribute information about pre-patch files. The pre-patch files are stored in a directory structure that uses the directory *PHCO_7635* as a relative root. In the case of this patch, all of the pre-patch files reside under */usr,* so there is a *usr* directory under *PHCO_7635.*

```
# ls /var/adm/sw/patch/PHCO_7635/usr
lib
# ls /var/adm/sw/patch/PHCO_7635/usr/lib
libsec.1  libsec.a
```

The file *FILE_LIST* is a list of all the new files in the patch and their associated file sets.

As previously mentioned, PHCO_6950 was once installed on the system. By removing PHCO_7635, we will be returning to the functionality of that patch. There is a similar directory for PHCO_6950 as well. However, superseded patches have special directory names. The directory names start with the character "%".

```
# ls /var/adm/sw/patch/%PHCO_6950
FILE_LIST    INFO         checkremove  postremove   preremove    usr
```

To remove PHCO_7635 you can simply use the command :

```
# swremove PHCO_7635
```

Effectively, this will move the pre-patch files (in this case the files under */var/adm/sw/patch/PHCO_7635/usr*) back under /. After the removal, the directory */var/adm/sw/patch/PHCO_7635* is removed. Since PHCO_7635 has been removed, the *%PHCO_6950* directory will be moved back to an active patch directory name, *PHCO_6950.*

All of this activity will be recorded in */var/adm/sw/patch/PATCH.log.* It is important to note two items in particular with the removal of patches. If the file */var/adm/sw/patch/PATCH_NOSAVE* exists, no original pre-patch files will be saved when a patch is installed. This can be done to save disk space. However, a patch cannot be removed if it was installed with the *PATCH_NOSAVE* file present.

Second, *swremove* does not reconfigure the kernel and reboot the system after the removal of a kernel patch. ◧

General HP-UX questions are answered by Bill Hassell, a support engineer at the HP Atlanta Response Center. He can be contacted via e-mail at blh@hpuerca.atl.hp.com. Workstation questions are answered by Susan Potter, an HP-UX system support engineer in the Atlanta Response Center. Her e-mail address is sup@atl.hp.com.

System Administration

by Chris Curtin

Sendmail

SENDMAIL—SURE I WANT TO send mail, why do you ask?

One of the first columns I wrote back in 1992 was about sendmail. Back then sendmail was a black box that most people were content to leave alone with their vendor's default configuration. The reason: poor documentation.

Cryptic configuration parameters are easy to set up when you know what they configure and have a reference where you can look up their meaning and syntax. For example, the modem string ATDT18005551212 looks pretty cryptic until you get your Hayes-compatible configuration manual and see that it means "Dial this number using Touch Tones."

Prior to late 1993 no such guide existed for sendmail. Most UNIX vendors had a man page or two and supplied a basic configuration, but changing it? Good luck.

So what happened in late 1993, November 1993 to be specific? The *Bat Book* was released. For those not familiar with the O'Reilly & Associates, Inc. Nutshell series of technical books, each book has a different cover, each with a different animal. The book released in November 1993 has a bat hanging by its feet on the cover, thus it is referred to as the *Bat Book.*

By now you have probably guessed that the book is about sendmail. What makes this book different is the authors. Eric Allman wrote the original version of sendmail and still actively enhances it. Neil Rickert is in charge of the maintenance of IDA sendmail. Byran Costales is the primary author who pulled information from both of them and put it all into a very readable, easy to follow book.

Before I go any further, here is the information about the book:

Sendmail
Bryan Costales with Eric Allman & Neil Rickert
O'Reilly & Associates, Inc.
November 1993, 792 pages.
ISBN: 1-56592-056-2
US$29.95

What is Sendmail?

Sendmail is a Mail Transport Agent (MTA), which means it is responsible for transporting mail (e-mail) between users on the same system and between users on distant/different systems. Think of it as the U.S Postal System. They will deliver mail pretty much anywhere and for the end user, it's as simple as putting the letter into the mailbox.

Why sendmail? The introduction to the *Bat Book* presents an interesting history of sendmail, but in a nutshell (pardon the pun) it was becoming too complex for every user's mail program to know how to route mail between users and computers. In the old days, a user's mail program had code in it to route mail between computers. That was fine when there was only one way to route mail. As UUCP and the Internet started being used, it was too cumbersome for one program to do all the work.

MTA versus MUA

As I explained earlier, Mail Transport Agents (MTA) are used for routing mail

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between users on the same computer and users on other computers. A Mail User Agent (MUA) is the program which the person composing and the person reading the mail interact with. MUAs know how to interface with the MTA at the local level for sending mail, and with the mail directory hierarchy when receiving mail.

By dividing the mail system into two parts, MUAs and an MTA, the user doesn't know or care how the mail is sent to the address supplied, only that it gets there. Likewise the recipient doesn't know or care how the mail got to him, only that it did.

The division allows personal preference and operating system independence for e-mail. By using one program, in this discussion sendmail, to route the mail, the users can use any program they wish to compose and read the mail. Common MUAs, which are blind without sendmail or a similar program to route their messages, are elm, exmh, mh, mailx, Eudora, Netscape Mail, or any of the online services e-mail systems.

Simply put, the MUA takes the message, with its destination address, and hands it to the MTA. The MTA then determines how to get the message to its destination.

Sendmail's Role As an MTA

Sendmail's role is to receive a message, rewrite any headers as required by your site, and send the message to its destination. Pretty straightforward, Right? Guess again.

Just for grins, edit */usr/lib/sendmail.cf* on your HP-UX 9.X (or earlier) system. The first 740 lines are all comments describing what you can change without losing HP's support. In reality, you can change only about half a dozen variables/macros and still receive HP support.

The last line of the first block of comments is, "If other changes are made to this file, you are on your own." Makes you want to modify the file, right?

The book goes into greater detail than I ever could about MTAs, MUAs, and the billion and one flags, macros and rules, but I will touch on an important subject: Rule Sets.

Rule Sets

Sendmail uses Rule Sets to determine who a mail message is for, the name of the host the person is on, and how the mail should be sent.

There are five basic rule sets (from Table 8-1: "The Purpose of Rule Sets," on page 80):

Rule Set	Purpose
0	Resolve a mail delivery agent
1	Process sender address
2	Process recipient address
3	Reprocess all addresses
4	Postprocess all addresses

Rule set 0 looks at the address type and determines what delivery agent to use. Delivery agents know the networking and protocol issues of how to send the mail. Examples of delivery agents are uux (for UUCP mail) and IPC (for TCP/IP-based SMTP mail).

Rule set 1 is used to change the sender's address. This typically involves adding the host and domain name to the address or completely changing the address for security purposes. For example user 'john' might have his address rewritten as *john@host.domain.com* or *JohnQPublic@host.domain.com.*

Rule set 2 is used to change the recipient's address. Similar to Rule Set 1, the recipient's address may be modified so the delivery agent can have an easier time delivering the message.

Rule set 3 is used to make the rules in rule sets 1 and 2 easier by breaking up the addresses, both sender and recipient, into basic parts: user name and destination (host/domain) name.

Rule set 4 puts the addresses back together so the delivery agents can send the mail.

These five are the basic sets, but you (or your vendor) can add new rule sets to handle odd or new addressing syntax.

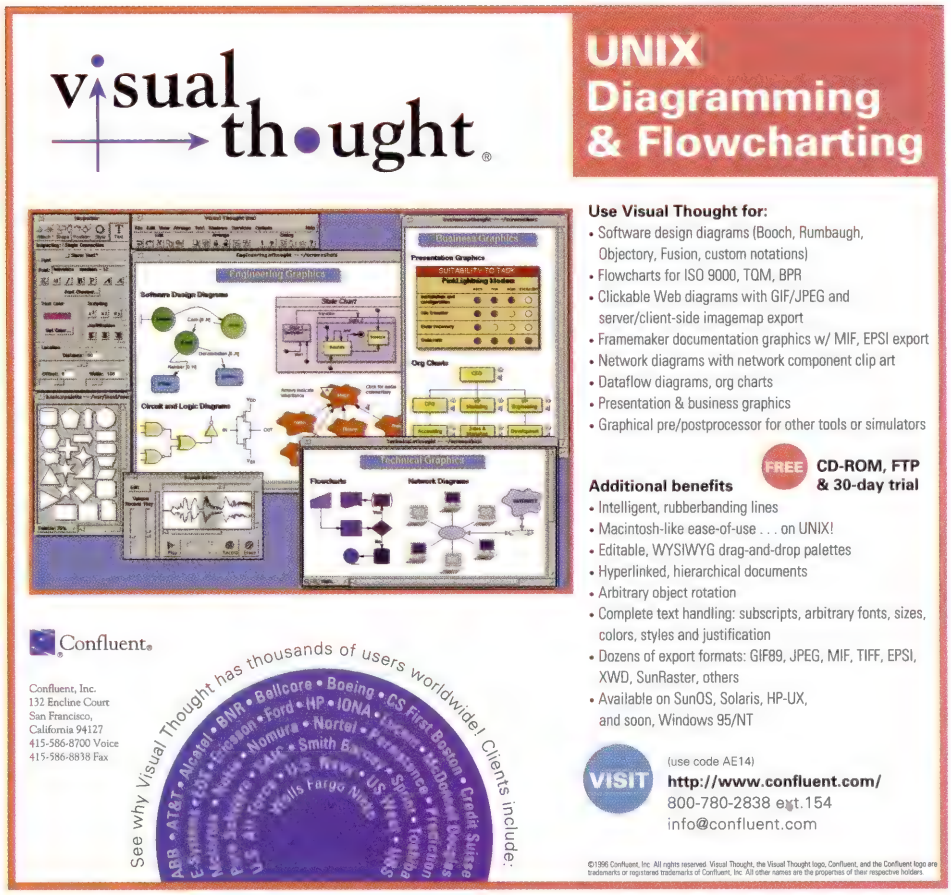
Mail Processing

When the message is first received, sendmail uses rule set 0 to determine how the message is to be transmitted. Sendmail looks at the format of the address of the recipient to determine what transport program to use. Standard HP sendmail configurations can understand UUCP, "standard" TCP-based e-mail, and X.400. If sendmail cannot determine the transport to use, it sends an error message to the originator.

Once the transport method is determined, sendmail uses Rule Set 3 to parse the address and modify it into the format acceptable by the transport method. All messages are evaluated by Rule Set 3.

Next, the message sender's address is evaluated and modified by Rule Set 1 and the message's recipient address is evaluated and modified by Rule Set 2.

Finally, the whole message is reassembled by Rule Set 4 and passed to the transport program.



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HP's standard *sendmail.cf* (which is sendmail's configuration file) Rule Set 3 adds some special tokens, such as .UXX, to the sender's and recipient's addresses based on the transport method. This makes the parsing of UUCP-based addresses easier by Rule Sets 1 and 2. In Rule Set 4, the .UUX suffix is removed before the message is passed to the uux program.

The subject of Rule Sets takes several chapters to discuss in the book, so these few paragraphs don't do them justice. I recommend reading the book if you are still interested (and not suprised if you aren't! It takes a few rereads to understand some of the chapters).

HP Sendmail

Sendmail, as shipped before HP-UX 10.x, has several known security problems and bugs. I strongly recommend that you contact HP, or their web site, and obtain the latest sendmail patches. I don't have access to a 10.x system right now, but I suggest contacting HP to find out if any new patches are available.

Old Columns

I have received several e-mail messages about previous columns. The first was about the January 1996 column where I presented a way to allow only root logins on a workstation console. I failed to mention during my discussion of the topic that Korn and Bourne shells are very sensitive to spaces in if 'test' blocks. For example:

```
if [$DISPLAY=chris:0]; then
```

is illegal. It must be:

```
if [ $DISPLAY = chris:0 ] ; then
```

(note the spaces between the *[* and *$DISPLAY* and the *0* and *]*). This also points out a second problem. In my example I used:

```
if [ ! $DISPLAY = okayDisplay ] ; then
```

It should have been:

```
if [ ! $DISPLAY = $okayDisplay:0 ] ; then
```

since *okayDisplay* is a variable defined earlier.

A couple of readers also pointed out that in the May 1996 column, my *lastLogin* script works only as root if you have restricted access to */etc/btmp* and */etc/wtmp* files. Basically, my system isn't as strict as it could (should) be and I allow all my users to use the *last* and *lastb* commands, which the script is based on. That said, do any of our readers have another way of getting last login information that is safer? Drop me some e-mail and I'll make sure you get credit for the idea.

The issue is that */etc/btmp* and */etc/wtmp* may contain password information if someone has typed a password at the login: prompt by mistake.

Finally, the URL for the HP-UX 10.x release notes I mentioned in the May 1996 issue is gone. NSLOOKUPs and pings don't work any more, so I guess they are gone. If anyone knows what happened to them, or if another source exists, let me know and I'll tell everyone in the next column.

That's it for this month. Keep the ideas and comments coming. ◧

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HP-UX

Upgrading Scripts

by David L. Totsch

THE TRANSITION TO HP-UX 10.0 consists of many, reasonably well-defined steps. One of the steps is to make shell scripts HP-UX 10.0-compliant. For the average, well-written shell script, a waltz through *analyzer* and a quick edit session will suffice.

While you are editing those shell scripts anyhow, I would like to challenge you with some concepts that might make your life less complex down the road.

Before we begin outlining changes to shell scripts, let's get a good idea of the scope of this project. My definition of "shell script" is not limited to that handful of nifty shell script utilities you have written. I am also including all of the *.profile* files on the system as well as the customized boot and shutdown out there.

As you review your Upgrade Plan and realize that you will need to change the PATH in more files than you care to count—and are writing the "quick and dirty" shell script to automate the task—ask yourself, Why am I doing this? Take a look at how your HP-UX 10.0 system is setting PATH in */etc/profile:*

```
grep PATH= /etc/profile
.
.
.
PATH=`cat /etc/PATH`
```

Take advantage of that nifty syntax above. Set PATH in all the places you set it using the syntax above. Now, keep */etc/PATH* up to date and you are set for life.

Other than a consistent PATH statement, the other problem most of us face is a consistent data environment. When you install a database product, you are usually asked to place some environmental information in */etc/profile.* When you upgrade the same RDBMS, you again visit */etc/profile.* Instead of putting that information directly into */etc/profile,* put it into */etc/RDBMS.profile.* Then include the following code wherever you need to reference the RDBMS environment:

```
if [ -r /etc/RDBMS.profile ]
then
  . /etc/RDBMS.profile
fi
```

You might want to beef up the above code to give an error or warning message if */etc/RDBMS.profile* is not readable or not found. You can also substitute RDBMS with the brand name of the database you use.

One last question: Why are you updating so many identical copies of users' *.profiles*? When multiple users, usually those in the same group, share a *.profile,* I tend to hard-link all of the files together and take away their write permissions. When they need a change, users need to see the owner of the file to make changes. That owner is responsible for seeing that the changes will not adversely affect everyone else in the group. (Or, you could use the same sourcing technique above so that each individual user still has an individually customizable *.profile.*)

Take a moment to consider the techniques presented above. Taking the time now to think them through and deploy them on your system could save you some future hassle. And I know we all could use a lot less of that.... ◧

David L. Totsch is working with HP-UX systems and wide-area networks for a Fortune 100 company in the Piedmont area of North Carolina. He can be reached via Internet: dtotsch@wfu.edu.

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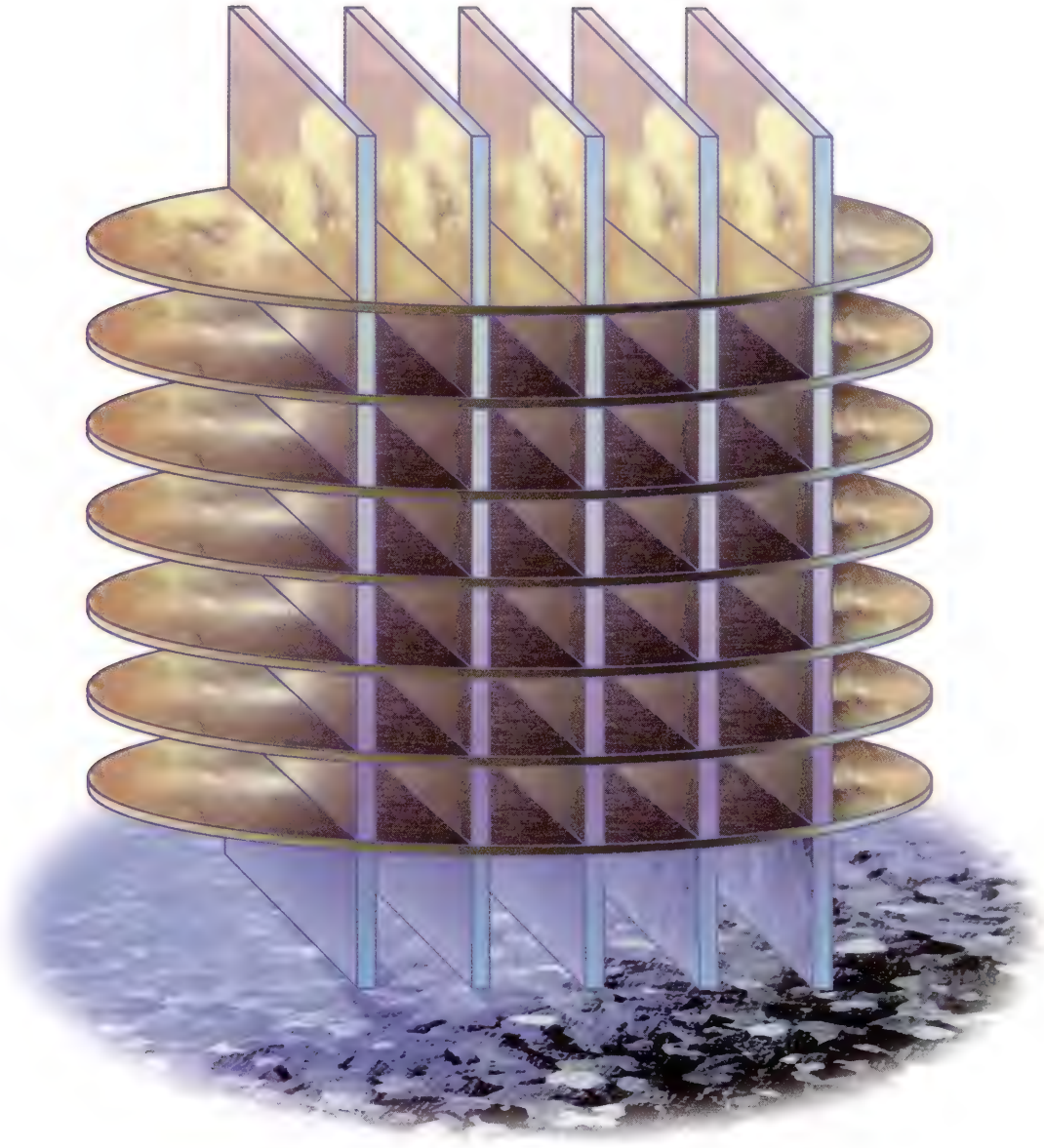


An Introduction to the Logical Volume Manager for HP-UX

By Jim Rice

With the introduction of HP-UX 10.0, system administrators of HP workstations will have run into a new feature of the operating system called the Logical Volume Manager. Commonly called LVM, this OS feature became available for the HP servers with the release of 9.0. Now, with the release of 10.0, LVM is available across the entire HP-UX product line. Not only does HP recommend that HP-UX system administrators use LVM to manage their disks, it's required if the system needs to boot using a disk that is larger than a 2-GB mechanism. For these reasons alone, it is worth while spending a little time learning what the Logical Volume Manager is and what it can do.

There isn't enough space in an article such as this to teach the system administrator all there is to know about using LVM, but we will provide enough background to understand what LVM is, what it can do, and what the basic commands and SAM interfaces can do to help manage the disks on an HP-UX system.

What is LVM?

System managers new to the Logical Volume Manager may be wondering just what it does. Well, the LVM provides the system administrator with a way of organizing the data on the computer independent of the size or configuration of the physical disks. The LVM can best be described as a tool that assists with the system administrator's control and management of data.

The LVM gives the system manager the ability to create disk partitions, dynamically increase the size of disk partitions, improve availability through data mirrors, and improve the performance of data I/O through distribution or striping of storage across disks. Before we spend time describing how LVM provides these capabilities, it's important to understand the terminology used when describing LVM configurations.

Physical Volumes

The basic unit of storage on most computers is the disk. The purpose of the Logical Volume Manager is to give the system manager the tools to manage disk space effectively. Any disk that is managed by the Logical Volume Manager is called a *physical volume* or simply a PV. Before a system administrator can manage disk space with the LVM, the disk must first be initialized using a command called *pvcreate*. Once the disk is initialized, it is referred to as a physical volume.

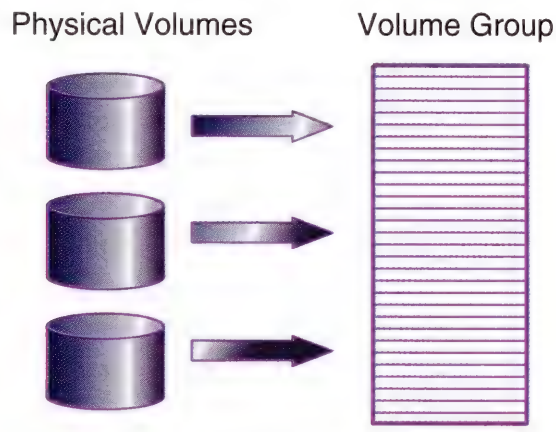
The volume group

The Logical Volume Manager organizes physical volumes into collections called *volume groups*. A volume group may have one PV in it or many. Think of a volume group as a container for disks. These containers can now be used to create places to store data for use by different people, projects, and functions. (See *Figure 1.*)

HP Instant Ignition systems, or systems that are installed from media with the Logical Volume Manager option selected, will have a single logical volume. This default is a logical volume that contains the operating system, swap space, and space for home directories. All logical volumes are referenced by names that are assigned at the time of their creation. The volume group name for the initial volume group for the operating system is *vg00*. When the system administrator creates a new volume group, it can be assigned any name. However, by default, additional volume groups are given the names *vg01, vg02,* etc.

Illustration by Stephen Kramer

FIGURE 1 *A Volume Group*



LISTING 1 *Output of vgdisplay command (w/ Logical Volume information deleted)*

```
$ vgdisplay -v vg00

--- Volume groups ---

VG Name                     /dev/vg00
VG Write Access             read/write
VG Status                   available
Max LV                      255
Cur LV                      8
Open LV                     8
Max PV                      16
Cur PV                      2
Act PV                      2
Max PE per PV               2000
VGDA                        4
PE Size (Mbytes)            4
Total PE                    499
Alloc PE                    365
Free PE                     134
Total PVG                   0

--- Physical volumes ---

PV Name                     /dev/dsk/c0t6d0
PV Status                   available
Total PE                    249
Free PE                     0
PV Name                     /dev/dsk/c0t4d0
PV Status                   available
Total PE                    250
Free PE                     134
```

If there are new or unused disks on the system, they can be used to build new volume groups or they can be added to an existing volume group, such as *vg00*. The decision to build a new volume group or add to an existing volume group depends largely on how the data is used and the system administrator's personal preferences. A new volume group can be built using the *vgcreate* command and disks are added to an existing volume group using the *vgextend* command.

For example, a J210 system may need to have two FW-SCSI 2-GB disks added as additional storage for application scratch space. Since application scratch space is not an operating system function, the system administrator might decide not to extend the existing *vg00* volume group. Instead, a new volume group could be created by putting the new physical volumes in their own VG named *vgScratch*.

NOTE: While not strictly illegal, it's a good practice not to mix disks of different types within a volume group. Placing FW-SCSI disks in a volume group with SE-SCSI disks can cause performance problems if care isn't taken; this situation should be avoided.

It is possible to see how many physical volumes are in a volume group and what the device names for those disks are by using the *vgdisplay* command. Using this command, the system administrator can see all of the attributes of a volume group, the number of physical volumes (PVs) in the volume group, and the pathnames to those physical volumes. (See *Listing 1.*)

Extents

Once the volume groups are defined, they need to be divided into partitions that can be used for swap, file systems, and

databases. By definition, the smallest unit in any volume group is called an *extent.* There are two types of extents in a volume group: physical extents and logical extents.

Physical extents, or PEs, are the units or pieces of physical volumes that are assigned to the volume group. These units or pieces are numbered to describe the locations of the physical extents on the physical volume. So, there are physical extents numbered *1* through *n* on each physical volume in the volume group. The number of physical extents for a physical volume in the volume group is determined by the size of the disk divided by the size of the PE.

A logical extent is the unit or piece of storage space that is used in the volume group. The logical extent is indexed from *1* to *n* across an entire logical volume, regardless of the physical volume that the extent is located on (See *Figure 2*). We will discuss logical volumes in more detail in the next section of this article.

The size of the extents in a volume group is determined at the time the VG is created and can be found by examining the output of the *vgdisplay* command. By default the size of an extent in the VG is 4 MB. So, for a 1-GB disk–like the Seagate ST31230N–the number of physical extents added to the physical volume would be 250. Furthermore, if there are two of these disks in the volume group, it would have a total of 500 extents available for use in logical volumes.

If it seems a little confusing to have two different kinds of extents in a volume group, it should begin to make a little more sense when we see how to use these units to define logical volumes in the next section.

FIGURE 2 *LVM Extents*

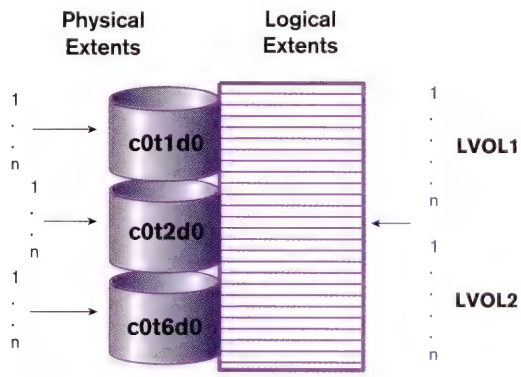
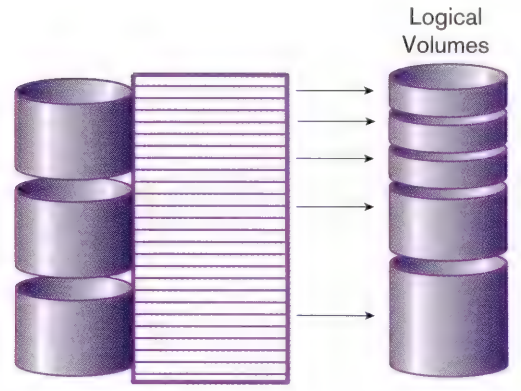


FIGURE 3 *Logical Volumes*



Logical Volumes

Finally, last but not least, it's time to talk about logical volumes. This article is, after all, about the Logical Volume Manager. We've talked about volume groups as containers for physical volumes and physical volumes as managed disks in the Logical Volume Manager. In the previous section, we talked about two different kinds of extents as ways to reference locations in the volume group. In this section, we will talk about using extents to construct Logical Volumes.

A logical volume, or LV, is the basic container in which we place operating system swap, file systems, or raw databases. The LV is built up from extents in the volume group and can be located anywhere on any disk in that volume group. It can be as small as one extent or as large as all of the available extents in the VG. Another name that's commonly used for a logical volume is *partition.* This is because a logical volume is typically a subset or "partition" within the volume group (see *Figure 3*).

We can see from *Figure 3* that we can have more logical volumes than disks in the volume group. This is because each logical volume is built up from the extents that make up the volume group. Not only can a logical volume be smaller than a whole disk, it can also be larger than any one disk in the volume group. In general, a logical volume's size is limited only by the total number of extents that make up the volume group.

The commands used to create and increase the size of a logical volume are *lvcreate* and *lvextend.* In general, we need

FIGURE 4 *Alternate Extents in a Logical Volume*

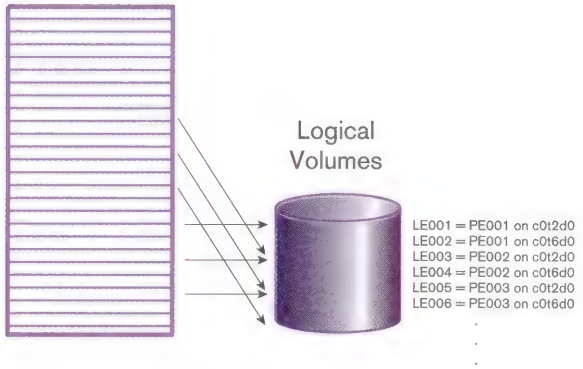
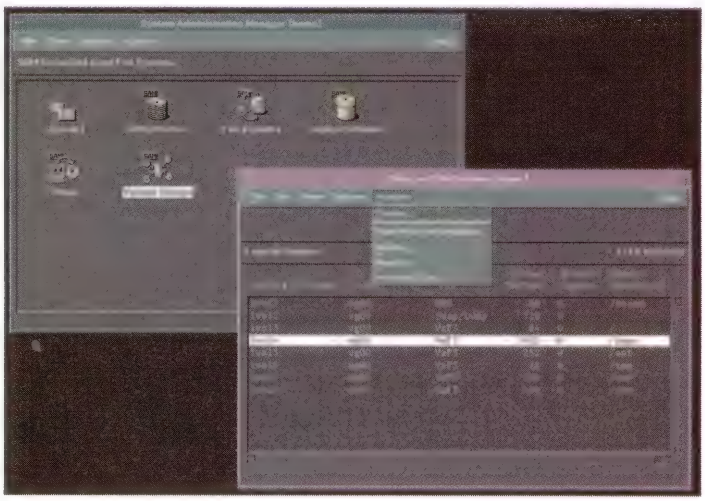


FIGURE 5 *SAM*



to define the name of the logical volume and the volume group the new LV is to be created in using the *lvcreate* command. We can also define the size of the logical volume at the time it is created. In addition, the system administrator can extend the size of an existing logical volume by using the *lvextend* command.

NOTE: Extending the size of the logical volume doesn't increase the size of the file system that is stored in the LV. In order to extend the file system in a newly expanded LV, another command called extendfs *is needed.*

One trick for improving the performance of a logical volume, say for a performance-sensitive file system, is to create the LV distributed across two or more disks. By creating an empty logical volume using *lvcreate* and then using *lvextend* to control the placement of the extents on specific physical volumes, the extents can be alternated between the disks. This increases performance because more disk heads are dedicated to the task of reading or writing the file system. While this can take some time to set up in the first place, the performance advantages can be significant. (See *Figure 4.*)

Mirrored and Striped Logical Volumes

Two of the more advanced features of the Logical Volume Manager that we can take advantage of are mirrored logical volumes and striped logical volumes. Neither of these features has any dependency on how the logical volume is used. It doesn't matter if we put a swap partition in the logical volume, an HFS file system, a VxFS file system, or a raw database. These features of LVM are designed to improve the system administrator's ability to meet the usage requirements of the data, regardless of how that data is stored in the logical volume.

If the system administrator needs to improve availability and reduce the time taken to recover from disk failures, the logical volume can be configured to write mirror copies of each of its extents to one or two other disks in the volume group. This feature is configured using the *lvextend* command to specify the number and the physical volume location for the mirrors.

When the data in the logical volume is performance-sensitive, the performance of the logical volume can be improved by striping the extents across multiple disks (similar to what we did in the last section by alternating the extents between disks). Striping the data across multiple disks in the volume group causes alternating stripes in an extent to be written across two or more disks. This is finer granularity than the extent distribution example in the previous section, typically in increments of 4, 8, 16, 32, or 64 KB. LVM striping is new to 10.0 and is faster and easier to configure than alternating extents. However, the system administrator has less control over the placement of the extents across the volume group than when the alternating extents are distributed across the PVs by hand.

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NOTE: LVM striping is the replacement for sds_admin for the HP-UX workstations. sds_admin is no longer supported at the 10.0 release of HP-UX.

LVM and SAM

If the configuration and management of the Logical Volume Manager seems a daunting task, the system administrator will be happy to know that the graphical system administration manager (SAM) on HP-UX is up to the task of configuring the LVM. SAM isn't a replacement for understanding the concepts behind the creation of the volume groups and logical volumes, but with SAM you don't have to remember the syntax or exact sequence of commands required to configure LVM. (*See Figure 5.*)

You cannot do within SAM everything that can be done with LVM on the command line, e.g., create alternating extents for a logical volume. In general, though, for the system administrator who configures LVM only occasionally, SAM ensures that configuration of the logical volumes is done correctly.

Backing Up The LVM Configuration

Unlike fixed-disk configurations, LVM data volumes can start and stop on arbitrary locations on the disks in the system. Therefore, special considerations need to be taken into account when backing up the system and protecting it from a disk failure. In addition to the normal file system backups, make sure there is a backup of the LVM configuration information ***every time there is a change to the configuration of the logical volumes.***

The commands that are used to back up, check, and restore the LVM configuration are *vgcfgbackup* and *vgcfgrestore.* The information about the configuration of the LVM is stored in the directory */etc/lvmconf.* ***Make sure this directory is backed up and kept in a safe place.***

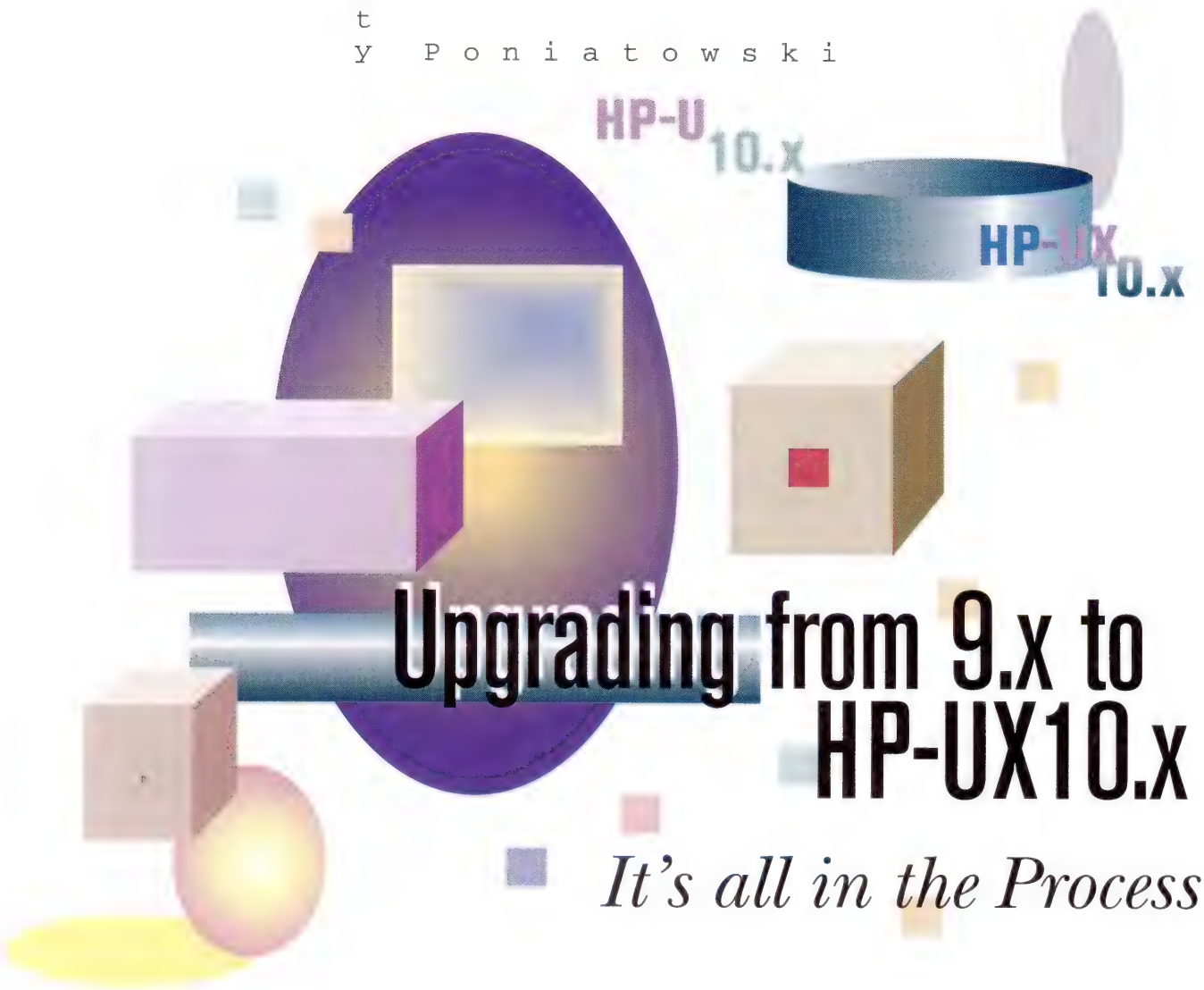
Conclusion

The Logical Volume Manager provides a wonderful tool to help match up the constraints of the physical disks on the computer system and the requirements of the data stored on them. Initially, a little work is required to learn the new terminology and processes for the configuration and management of LVM, but once the system administrator has mastered the concepts and learned a few simple commands, it's hard to go back to the limitations and constraints that hard disk partitions impose.

To learn more about the concepts, configuration, and use of the Logical Volume Manager, read chapter 3 of the *HP-UX System Administration Tasks* manual. Or, do a keyword search of LVM in the HP-UX LaserROM. ◧

Jim Rice is a Field Technical Consultant with Hewlett-Packard, where he helps system administrators develop and implement their technical computing infrastructures (and live to tell about them). He has also served for the last three years on the board of directors for the InterWorks Technical Users Forum of Interex. He can be reached for comment through e-mail at jrice@hp.com.

by Marty Poniatowski



Upgrading from 9.x to HP-UX10.x

It's all in the Process

Every Upgrade Is Different

I could never provide enough examples to cover all the possible issues you might encounter when upgrading from HP-UX 9.x to 10.x. Every system is at least a little different. Sometimes the differences between upgrading systems are immense. What I'll do in this article is provide an example of upgrading a T500 from HP-UX 9.x to 10.x. This is a monstrous system with 12 processors, two GBytes of main memory, and several hundred GBytes of disk. Because of the size and complexity of the system, I encountered many problems during the upgrade, although I'm not telling you this because I want to scare you off.

If you have a more modest system, you will probably encounter a small fraction of the problems I encountered. The many small systems I have upgraded had few problems during upgrade (some even had none), so you can probably expect your upgrade to go much more smoothly. If you have an HP server running HP-UX 9.x, you will probably see many similarities between what I cover in this article and what you encounter when you perform your upgrade to HP-UX 10.x. If you are upgrading an HP workstation to HP-UX 10.x, you will see fewer similarities between this article and your upgrade procedure, but you can still use much of the information given here when you perform your upgrade.

Illustration by Gale Patterson

Please don't use this article as a guide for performing an upgrade. My goal is only to provide you with some background by reviewing an example of an upgrade.

Where To Begin

An understanding of HP-UX 10.x is invaluable to performing the upgrade. If you know where you're going, to HP-UX 10.x in this case, it's a lot easier to get there. The other thing you need is a plan. Included with this article is a Flowchart (pages 32 & 33) I used in a recent upgrade. Many of the blocks apply to most upgrades; other blocks may not. There are also some blocks that were not part of this upgrade that would be required for other upgrades. Since I will be describing a particular upgrade, I will refer to this Flowchart often.

1) Understand HP-UX 10.x

The first block of the Flowchart is accompanied by comments on five items that will help with the knowledge required for the upgrade. Each is helpful in its own way. The one you can't do without under any circumstances is the HP manual called *Upgrading from HP-UX 9.x to 10.0 Version B.10.01* (part number B2355-90083). There may now be a newer version of this manual. I will call this the *Upgrading Manual* throughout this article. I recommend using this, or a newer version of it, as a guide for performing your upgrade. In addition, some of the system administrators with whom I work attended the HP Training Course entitled "Upgrading to HP-UX 10.x Hands On Workshop" at an HP Education Center. The course and materials provided were very useful.

The *Upgrading Manual* should be read and followed from start to finish. If you encounter a topic that simply doesn't apply to your system, ignore it, but I would not recommend skipping around the manual. The *Upgrading Manual* provides estimates for the amount of time various upgrades will consume. You want to review this so you know how much time may be consumed by your upgrade. The other documents will also be helpful to you before, during, and after the upgrade.

My last recommendation here is to contact the upgrade team. HP has upgrade specialists who can assist you with the upgrade. They charge based on the complexity of your environment. If you have a simple environment, they won't charge much and having their help will make things go more smoothly. If you have a complex environment, they'll charge more, but you may also need them more for a complex upgrade.

The upgrade specialist informed me of some nuances to the procedure that saved me a lot of time when I performed the T500 upgrade. With the help of the upgrade specialist, I was able to work around difficulties with upgrading when Token Ring was the primary network interface (Token Ring on the Application CD-ROM caused problems with Software Distributor after the system booted). He also made me aware of problems with Remote Watch filesets, syncing disk mirrors, and other potential difficulties.

2) Understand Your System

Please don't be insulted by this. You may know everything about your system, in which case please ignore this step. If, however, over the years your system has gone through many upgrades, such as adding disks and controllers, and you haven't kept careful track of them, you may want to audit your system carefully. A full system audit involves evaluating every area of your system. Here are some of the essential checks I suggest you perform prior to upgrading your system:

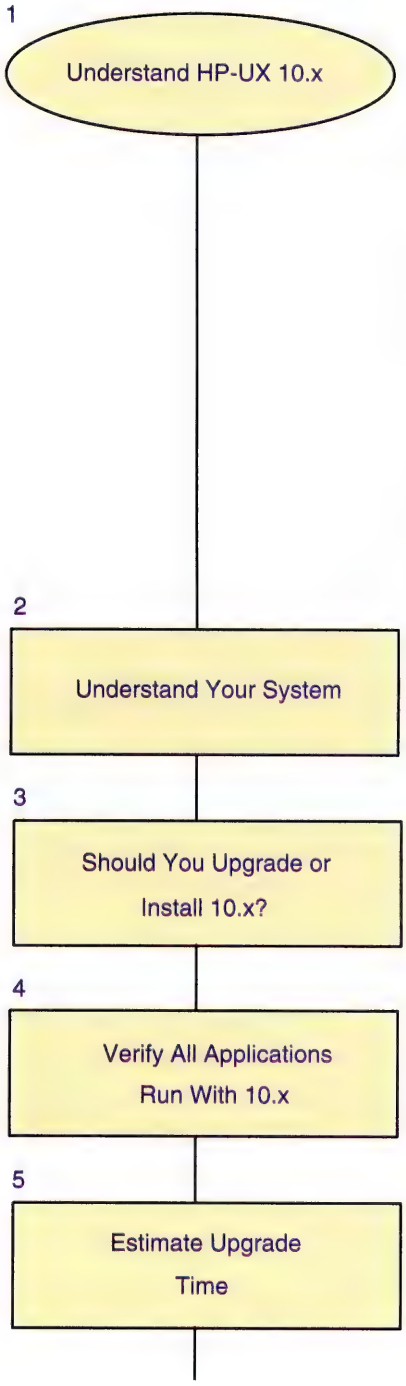
Patches—You need to have the patches essential to the operation and recovery of your system installed. If you do not know which patches apply to your system, you should call the HP Response Center and find out how to access the full list of patches online. In addition, there may be some patches you should apply to your system immediately after the upgrade.

ioscan—Type commands such as `ioscan -f` and `ioscan -funC disk` to get a listing of all the disks connected to your system. Having a physical listing of the disks connected to your system will prove to be helpful. *Listing 1* shows *ioscan* listings from a system running HP-UX 9.04 (the second is a partial listing only).

vgdisplay—Understand the current state of your volume groups. *ioscan* provides you with useful physical information. `vgdisplay -v` tells you how the physical disks are grouped. This is helpful for overall understanding of volume group information. `vgdisplay -v /dev/vg00` would provide useful information about volume group *vg00*. The following is a partial *vgdisplay* listing of an HP-UX 9.04 system:

```
# vgdisplay -v
--- Volume groups ---
VG Name          /dev/vg00
VG Status        available
Max LV           255
Cur LV           12
Open LV          5
```

Continued on Page 36



Review material such as:

- Release Notes for HP-UX 10.x
- HP Ed Center courses and seminars such as:
  "Upgrading to HP-UX 10.x Hands On Workshop"
  "New Features and Functions of HP-UX 10.x"
- *HP-UX 10.x System Administration "How To" Book*
  ISBN 0-13-125873-7
  Chapters on file system, Software Distributor, and device files, topics you must know to perform upgrade.
- *Upgrading from HP-UX 9.x to version B10.01*
  HP Part # B2355-90083 (*Upgrade Manual*)
- *Offline Diagnostics Environment (ODE) Users Manual* HP Part # 5962-3648

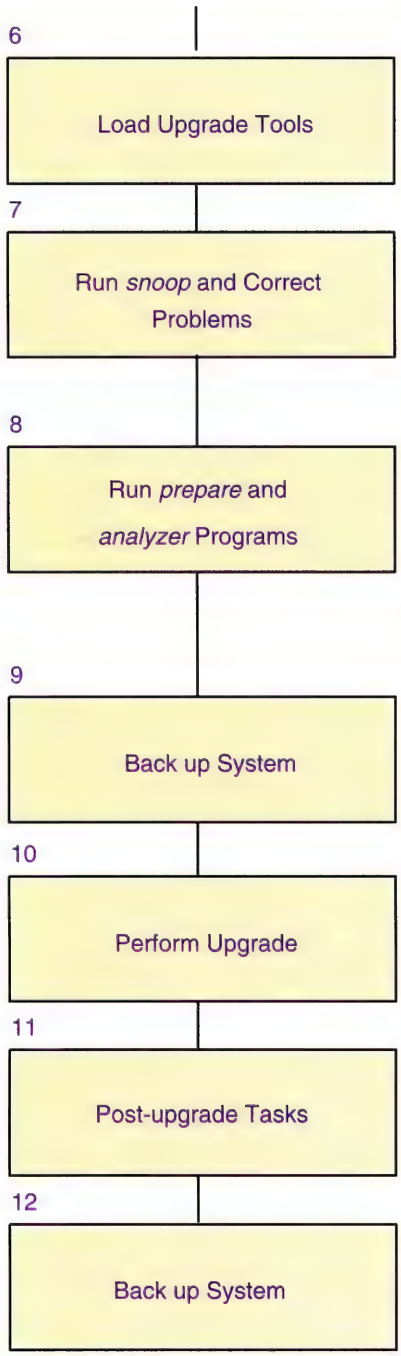
Run commands to give you a profile of your system: *ioscan*, logical volume commands, *bdf*, etc.

Install if you have a new computer or if you want to convert root disk to LVM.

May need to upgrade apps before HP-UX upgrade. Include app vendors in upgrade team. Application test suite.

Upgrade Manual estimates:

- With transition links - 15 to 37 hours
- Full preparation - 24 to 48+ hours



Print manual pages for *snoop, prepare, analyzer, fnlookup,* etc.

snoop.log contains "problems," "cautions," and "notes." Review and correct all "problems." Problem example: The file system '/' does not have enough disk space...

Review three different approaches. *prepare* organizes files into scripts, text, etc. *analyzer* makes 10.x changes to original or copy of files. You may want to write a script to compare original files to *analyzer*- generated files.

- Use *COPYUTIL* from ODE Manual.
- Back up system.

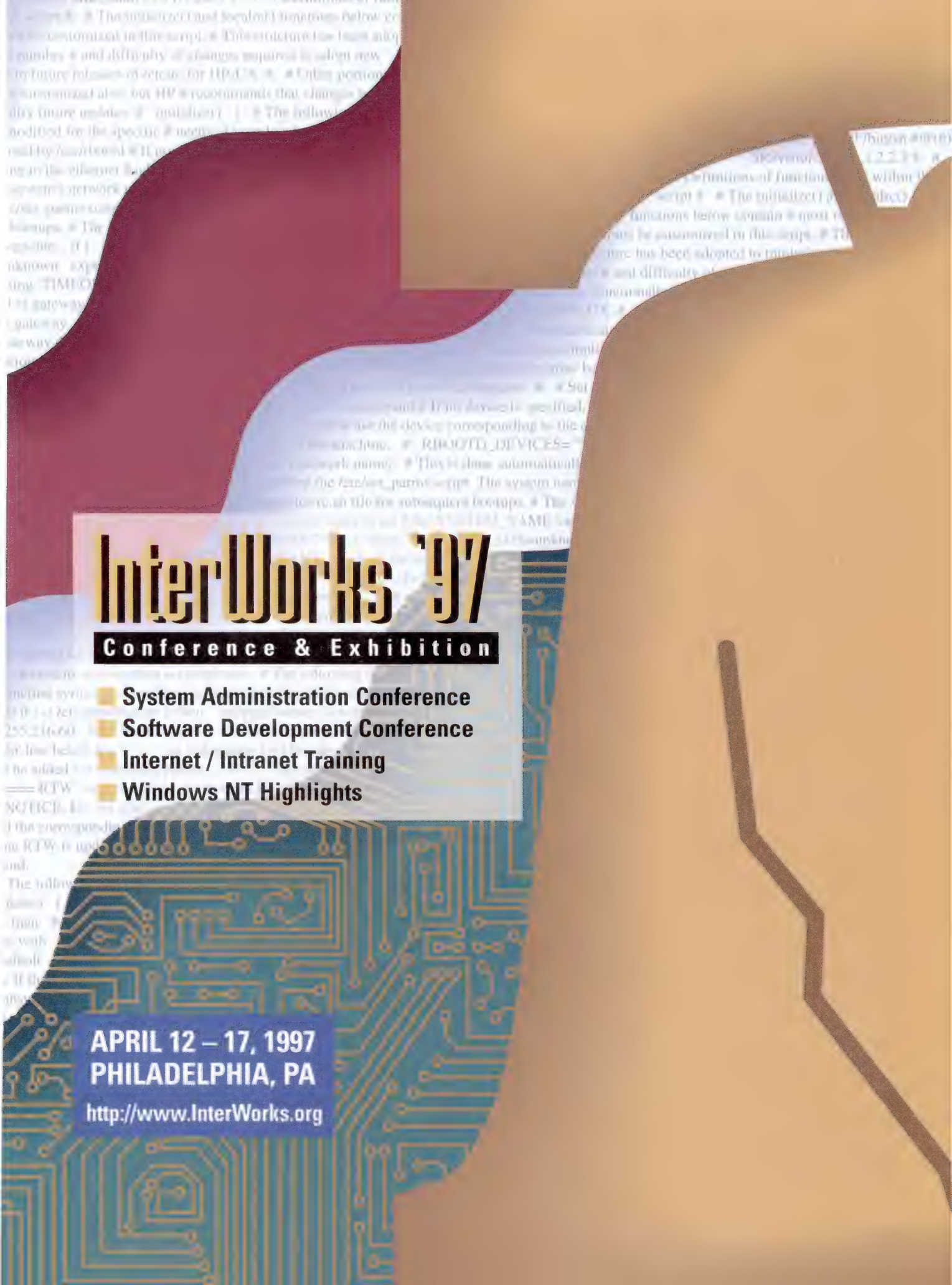
If upgrade fails use backup disk or recovery tape.

May have to modify startup scripts and other such tasks. Verify all applications are running. Load any 10.x patches required.

Make new backup and recovery tapes.

LISTING 1 *ioscan* Output

```
# ioscan -f
Class       LU  H/W Path Driver                 H/W Status        S/W Status
=============================================================================
nacc         -  4        nacc0                  ok(0x4d80)        ok
scsi         -  8        scsi1                  ok(0x3980)        ok
target       -  8.4      scsi1.target           ok(0x0)           ok
disk         7  8.4.0    scsi1.target.disc3     ok(0x0)           ok
target       -  8.5      scsi1.target           ok(0x0)           ok
disk         5  8.5.0    scsi1.target.disc3     ok(0x0)           ok
target       -  8.6      scsi1.target           ok(0x0)           ok
disk         2  8.6.0    scsi1.target.disc3     ok(0x0)           ok
printer      0  9        lpr2                   ok(0x3a80)        ok
tty          1  16       mux2                   ok(0x10000d00)    ok
scsi         -  52       scsi1                  ok(0x3980)        ok
target       -  52.0     scsi1.target           ok(0x1800202)     ok
tape_drive   0  52.0.0   scsi1.target.tape2     ok(0x1800202)     ok
target       -  52.2     scsi1.target           ok(0x5)           ok
disk         1  52.2.0   scsi1.target.disc3     ok(0x5)           ok
target       -  52.3     scsi1.target           ok(0x0)           ok
disk         6  52.3.0   scsi1.target.disc3     ok(0x0)           ok
target       -  52.4     scsi1.target           ok(0x0)           ok
disk         3  52.4.0   scsi1.target.disc3     ok(0x0)           ok
target       -  52.5     scsi1.target           ok(0x0)           ok
disk         4  52.5.0   scsi1.target.disc3     ok(0x0)           ok
target       -  52.6     scsi1.target           ok(0x0)           ok
disk         0  52.6.0   scsi1.target.disc3     ok(0x0)           ok
lanmux       -  56       lanmux0                ok(0x10006080)    ok
tty          0  56.0     lanmux0.mux4           ok(0x0)           ok
lan          0  56.1     lanmux0.lan3           ok(0x1)           ok
lantty       0  56.2     lanmux0.lantty0        ok(0x2)           ok
processor    -  61       processor              ok(0x481)         ok
processor    -  62       processor              ok(0x481)         ok
memory       -  63       memory                 ok(0x900)         ok

# ioscan -funC disk

Class     LU  H/W Path Driver                 H/W Status        S/W Status

=============================================================================

disk       7  8.4.0    scsi1.target.disc3     ok(0x0)           ok

                /dev/diag/dsk/c7d0  /dev/rdsk/c7d0s0
                /dev/dsk/c7d0s0     /dev/rdsk/c7d0s1
                /dev/dsk/c7d0s1     /dev/rdsk/c7d0s10
                /dev/dsk/c7d0s10    /dev/rdsk/c7d0s11
                /dev/dsk/c7d0s11    /dev/rdsk/c7d0s12
                /dev/dsk/c7d0s12    /dev/rdsk/c7d0s13
                /dev/dsk/c7d0s13    /dev/rdsk/c7d0s14
                /dev/dsk/c7d0s14    /dev/rdsk/c7d0s15
                /dev/dsk/c7d0s15    /dev/rdsk/c7d0s2
                /dev/dsk/c7d0s2     /dev/rdsk/c7d0s3
                /dev/dsk/c7d0s3     /dev/rdsk/c7d0s4
                /dev/dsk/c7d0s4     /dev/rdsk/c7d0s5
                /dev/dsk/c7d0s5     /dev/rdsk/c7d0s6
                /dev/dsk/c7d0s6     /dev/rdsk/c7d0s7
                /dev/dsk/c7d0s7     /dev/rdsk/c7d0s8
                /dev/dsk/c7d0s8     /dev/rdsk/c7d0s9
                /dev/dsk/c7d0s9

disk       5  8.5.0    scsi1.target.disc3     ok(0x0)           ok

                /dev/diag/dsk/c5d0  /dev/rdsk/c5d0s0
                /dev/dsk/c5d0s0     /dev/rdsk/c5d0s1
                /dev/dsk/c5d0s1     /dev/rdsk/c5d0s10
                /dev/dsk/c5d0s10    /dev/rdsk/c5d0s11
                /dev/dsk/c5d0s11    /dev/rdsk/c5d0s12
                /dev/dsk/c5d0s12    /dev/rdsk/c5d0s13
                /dev/dsk/c5d0s13    /dev/rdsk/c5d0s14
                /dev/dsk/c5d0s14    /dev/rdsk/c5d0s15
                /dev/dsk/c5d0s15    /dev/rdsk/c5d0s2
                /dev/dsk/c5d0s2     /dev/rdsk/c5d0s3
                /dev/dsk/c5d0s3     /dev/rdsk/c5d0s4
                /dev/dsk/c5d0s4     /dev/rdsk/c5d0s5
                /dev/dsk/c5d0s5     /dev/rdsk/c5d0s6
                /dev/dsk/c5d0s6     /dev/rdsk/c5d0s7
                /dev/dsk/c5d0s7     /dev/rdsk/c5d0s8
                /dev/dsk/c5d0s8     /dev/rdsk/c5d0s9
                /dev/dsk/c5d0s9

disk       2  8.6.0    scsi1.target.disc3     ok(0x0)           ok

                /dev/diag/dsk/c2d0  /dev/rdsk/c2d0s0
                /dev/dsk/c2d0s0     /dev/rdsk/c2d0s1
                /dev/dsk/c2d0s1     /dev/rdsk/c2d0s10
                /dev/dsk/c2d0s10    /dev/rdsk/c2d0s11
                /dev/dsk/c2d0s11    /dev/rdsk/c2d0s12
                /dev/dsk/c2d0s12    /dev/rdsk/c2d0s13
                /dev/dsk/c2d0s13    /dev/rdsk/c2d0s14
                /dev/dsk/c2d0s14    /dev/rdsk/c2d0s15
                /dev/dsk/c2d0s15    /dev/rdsk/c2d0s2
                /dev/dsk/c2d0s2     /dev/rdsk/c2d0s3
                /dev/dsk/c2d0s3     /dev/rdsk/c2d0s4
                /dev/dsk/c2d0s4     /dev/rdsk/c2d0s5
                /dev/dsk/c2d0s5     /dev/rdsk/c2d0s6
                /dev/dsk/c2d0s6     /dev/rdsk/c2d0s7
                /dev/dsk/c2d0s7     /dev/rdsk/c2d0s8
                /dev/dsk/c2d0s8     /dev/rdsk/c2d0s9
                /dev/dsk/c2d0s9

disk       1  52.2.0   scsi1.target.disc3     ok(0x5)           ok

                /dev/diag/dsk/c1d0  /dev/rdsk/c1d0s0
                /dev/dsk/c1d0s0     /dev/rdsk/c1d0s1
                /dev/dsk/c1d0s1     /dev/rdsk/c1d0s10
                /dev/dsk/c1d0s10    /dev/rdsk/c1d0s11
                /dev/dsk/c1d0s11    /dev/rdsk/c1d0s12
                /dev/dsk/c1d0s12    /dev/rdsk/c1d0s13
                /dev/dsk/c1d0s13    /dev/rdsk/c1d0s14
                /dev/dsk/c1d0s14    /dev/rdsk/c1d0s15
                /dev/dsk/c1d0s15    /dev/rdsk/c1d0s2
                /dev/dsk/c1d0s2     /dev/rdsk/c1d0s3
                /dev/dsk/c1d0s3     /dev/rdsk/c1d0s4
                /dev/dsk/c1d0s4     /dev/rdsk/c1d0s5
                /dev/dsk/c1d0s5     /dev/rdsk/c1d0s6
                /dev/dsk/c1d0s6     /dev/rdsk/c1d0s7
                /dev/dsk/c1d0s7     /dev/rdsk/c1d0s8
                /dev/dsk/c1d0s8     /dev/rdsk/c1d0s9
                /dev/dsk/c1d0s9     /dev/src_device
```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```
Max PV          16
Cur PV          2
Act PV          2
Max PE/PV       1016
VGDA            4
PE Size (MB)    4
Total PE        1014
Alloc PC        88
Total PVG       0

--- Logical volumes ---
LV Name         /dev/vg00/lvol1
LV Status       available/syncd
LV Size (MB)    104
Current LE      26
Allocated PE    26
Used PV         1

LV Name         /dev/vg00/lvol2
LV Status       available/syncd
LV Size (MB)    512
Current LE      128
Allocated PE    128
Used PV         1
```

lvdisplay—Issuing the `lvdisplay -v` command will tell you everything about *lvol1*. If you are using disk mirroring, it will provide information on what physical volume both the original copy of the data and mirrored copies of data reside on. In the upgrades in which I have participated, we split the mirror of the root volume prior to upgrading. I think this made the upgrades easier and allowed us to have a copy of the "stale" root volume handy as changes were made to the original root volume. In one case many files were copied from the "stale" root volume to the original root volume when files were accidentally deleted from the original root volume. The following is an example of *lvdisplay*:

```
# lvdisplay -v /dev/vg00/root

--- Logical volumes ---
LV Name                 /dev/vg00/root
VG Name                 /dev/vg00
LV Permission           read/write
LV Status               available/syncd
Mirror copies           1
Consistency Recovery    NOMWC
Schedule                parallel
LV Size (Mbytes)        752
Current LE              188
Allocated PE            376
Bad block               off
Allocation              strict/contiguous

--- Distribution of logical volume ---
PV Name             LE on PV  PE on PV
/dev/dsk/c6d0s2     188       188
/dev/dsk/c7d0s2     188       188

--- Logical extents ---
LE   PV1                PE1  Status 1 PV2                PE2  Status 2
0000 /dev/dsk/c6d0s2    0000 current  /dev/dsk/c7d0s2    0000 current
0001 /dev/dsk/c6d0s2    0001 current  /dev/dsk/c7d0s2    0001 current
0002 /dev/dsk/c6d0s2    0002 current  /dev/dsk/c7d0s2    0002 current
0003 /dev/dsk/c6d0s2    0003 current  /dev/dsk/c7d0s2    0003 current
0004 /dev/dsk/c6d0s2    0004 current  /dev/dsk/c7d0s2    0004 current
0005 /dev/dsk/c6d0s2    0005 current  /dev/dsk/c7d0s2    0005 current
0006 /dev/dsk/c6d0s2    0006 current  /dev/dsk/c7d0s2    0006 current
0007 /dev/dsk/c6d0s2    0007 current  /dev/dsk/c7d0s2    0007 current
0008 /dev/dsk/c6d0s2    0008 current  /dev/dsk/c7d0s2    0008 current
0009 /dev/dsk/c6d0s2    0009 current  /dev/dsk/c7d0s2    0009 current
0010 /dev/dsk/c6d0s2    0010 current  /dev/dsk/c7d0s2    0010 current
0011 /dev/dsk/c6d0s2    0011 current  /dev/dsk/c7d0s2    0011 current
```

Notice that this logical volume is mirrored and that the mirror is current, not stale.

bdf—Knowing what file systems are mounted is important. I have worked on systems with hundreds of mounted file systems. You want to know what file systems you have mounted before you upgrade and you should keep a record in a file so that after your */etc/checklist* file is converted into */etc/fstab*, you'll have a record of what was mounted before the update in case there is a problem with */etc/fstab*. On the T500 upgrade I ran out of inodes as the system was rebooting after upgrading. I am, therefore, sensitive to running out of inodes so I usually issue the *bdf* command

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with the *-i* option for inodes as shown in the following listing (we'll see this again later):

```
# bdf -i
Filesystem          kbytes    used   avail %cap iused   ifree iused Mounted on
/dev/vg00/lvol1     105117   73605   21000  78%  8902    1338  87%  /
/dev/vg027/lvol1   2057629  424514 1427352  23% 36251  137829  21%  /mnt1
/dev/vg00/lvol5     202333   28771  153328  16%  1619   16813   9%  /users
/dev/vg037/lvol1   2057629       9 1851857   0%     4  174076   0%  /appl/p006
/dev/vg003/lvol1   1036861  553043  380131  59%  2734   85330   3%  /opt
/dev/vg002/lvol1   1539053 1129603  255544  82%  6513  124559   5%  /home/users
/dev/vg00/lvol4     404957  111541  252920  31%  1723   33093   5%  /tmp
/dev/vg00/lvol3     607581  364280  182542  67% 11663   39537  23%  /usr
```

Notice that the root volume has only 1,338 free inodes. This system has 100 disks connected to it, each of which has a total of 32 device files associated with it, if you take into account both the block (*/dev/dsk*) and character (*/dev/rdsk*) devices. The symbolic links that will be created to map the HP-UX 9.x device files to HP-UX 10.x devices files mean that roughly 3,200 device files are required. I do not have that many inodes available! Since I was using only section 2 of each disk, I produced a shell program to delete all but section 2 device files. Before doing this, however, I copied the entire */dev* directory to */opt/dev* so that if I had deleted a device file I needed, I could retrieve it. After doing this, I ran the script to delete unneeded disk device files. I have to warn you to be careful to ensure you won't need any device files you delete before deleting them. Issuing `bdf -i` showed that thousands of new inodes became free after these device files were deleted.

In addition, you may want to consider creating a separate logical volume for a directory such as */var* or */opt* to free up inodes. The T500 had */opt* as a separate logical volume, but */var* was under root. We created a separate */var* logical volume both to free up inodes and to provide more space for */var* in HP-UX 10.x.

lifls—The *lifls* command will provide you information about your LIF boot area. You may want to issue this command just as a sanity check of your root disk to ensure everything is in place to boot as shown in the following listing. I have issued this command for both the root volume and its mirror:

```
# lifls -Clv /dev/dsk/c6d0s2
volume ISL10 data size 7812 directory size 8 95/11/04 14:20:09
filename    type   start   size     implement  created

================================================================
ISL         -12800 584     240      0          95/11/04 14:20:09
HPUX        -12928 824     752      0          95/11/04 14:20:10
IOMAP       -12960 1576    720      0          95/11/04 14:20:10
ODE         -12960 2296    400      0          95/11/04 14:20:10
MAPFILE     -12804 2696    16       0          95/11/04 14:20:10
```

```
SYSLIB      -12801 2712    400      0          95/11/04 14:20:10
MAPPER      -12802 3112    124      0          95/11/04 14:20:10
RDB         -12960 3240    592      0          95/11/04 14:20:10
AUTO        -12289 3832    1        0          95/11/04 14:20:10
LABEL       BIN    3840    4        0          96/01/18 00:25:17

# lifls -Clv /dev/dsk/c7d0s2
volume ISL10 data size 7812 directory size 8 95/11/04 14:20:09
filename    type   start   size     implement  created

================================================================
ISL         -12800 584     240      0          95/11/04 14:20:09
HPUX        -12928 824     752      0          95/11/04 14:20:10
IOMAP       -12960 1576    720      0          95/11/04 14:20:10
ODE         -12960 2296    400      0          95/11/04 14:20:10
MAPFILE     -12804 2696    16       0          95/11/04 14:20:10
SYSLIB      -12801 2712    400      0          95/11/04 14:20:10
MAPPER      -12802 3112    124      0          95/11/04 14:20:10
RDB         -12960 3240    592      0          95/11/04 14:20:10
AUTO        -12289 3832    1        0          95/11/04 14:20:10
LABEL       BIN    3840    4        0          96/01/18 01:26:11
```

You may want to place the output of these commands and any others you want to issue in a directory and save this directory to tape. I created a */IMPORTANT* directory that contained the output of many commands and files such as */etc/checklist*, */etc/rc*, and others.

There may be other commands you think you should issue. The minimum you need to do is understand the commands I have covered here and any others you think are appropriate, and use these carefully to document your existing system.

3) Install or Upgrade?

Some systems cannot and should not be upgraded to HP-UX 10.x. On a new system, for instance, you should just install HP-UX 10.x. If you want to convert the root disk on your system to logical volume manager, you will also need to install. These are described in the *Upgrade Manual*. Among the systems the *Upgrade Manual* says cannot be upgraded are Series 300 and 400 workstations.

4) Verify All Applications Will Run With HP-UX 10.x

You don't own your HP-UX system to run HP-UX. You own it to run your applications and get your job done. Make your application vendor(s) part of the upgrade team and verify that all applications will run with HP-UX 10.x. As part of the T500 upgrade we installed HP-UX 10.x certified applications on the system while it was still running HP-UX 9.x and ran the applications for an extended period. We therefore knew that the applications were running smoothly before the upgrade, which eliminated this variable from the upgrade process.

5) Estimate Upgrade Time

The upgrade will take time and effort. The *Upgrade Manual* uses estimates of from 15 to 48 hours or more to complete an upgrade. Because I upgrade other people's systems, I am as careful as possible. I have found that I spend more than 48 hours to complete an upgrade. I am an admittedly slow HP-UX system administrator, but you should plan on the upgrade taking a substantial amount of time and being a focused effort.

Small systems such as a Series 700 workstation dedicated to one user took me as little as two and a half hours. The T500 upgrade took roughly 80 hours. It depends on the complexity of your system and the number of problems *snoop* runs into. I have found the factor that contributes the most to the upgrade time is freeing up disk space. If you have to perform such tasks as splitting */var* and */opt* from root in order to free up additional disk space in root, your upgrade will take longer. This is because the logical volume manager work you have to perform is time consuming. In addition, tasks that involve reconfiguring logical volumes may require you to have no users on your system when you are performing these tasks.

You should plan on taking the time required to perform your upgrade properly. It will take a few hours just to run *COPYUTIL* (described in an upcoming section), so don't expect your upgrade to take only minutes.

6 and 7) Load Upgrade Tools and Run *snoop*

A good place to start your upgrade is with the upgrade tools. The upgrade software comes with some useful tools, including *snoop*. In this upgrade I

mounted the upgrade CD-ROM and ran */usr/sbin/snoop*. *snoop* runs Software Distributor, which provides an interface through which you can load all *snoop* software on your system. Software Distributor is the standards-based method for loading software in HP-UX 10.x. You will want to familiarize yourself with it before performing the upgrade. I devoted a substantial amount of space in my system administration book to Software Distributor. Bill Mullaney's two-part article "SD for HP-UX 10.0" in the September and November 1995 issues of *hp-ux/usr* is a useful introduction to Software Distributor.

After *snoop* is loaded on your system, you can run it and view all of the "cautions" and "problems" it has identified on your system in the */var/adm/sw/snoop.log* file. Running *snoop* for the first time takes a long time. This is a thorough program that evaluates your system for a variety of potential problems. You can preview disk space consumption to determine if you have enough disk space to run *upgrade* on your system based on the software you currently have loaded on your HP-UX 9.x system. Here is a list of files in the */usr/adm/sw* directory after several *snoop* runs:

defaults	*host_object*
products	*security*
snoop.log	*snoop.log.9.9.96*
swagent.log	*swagentd.log*
swistall.log	*swpackage.log*

There are some files of great interest in this directory. The most important is *snoop.log*. Any problems in this file will cause the upgrade to fail. I renamed the output of a previous run of *snoop.log* to *snoop.log.9.9.96* because subsequent runs of *snoop* will append the results to the end of *snoop.log*. This is true of the other files as well, but since my primary interest is with *snoop.log*, it is the only file I renamed before rerunning *snoop*. The files in this directory beginning with "sw" are Software Distributor related. Since *snoop* runs Software Distributor as part of the analysis process, there are several log files created there as well.

snoop Problems

The following list contains some of the problems and cautions that appeared during my many *snoop* runs. I also have comments that describe how the problems were fixed. These did not all appear in the same *snoop* run. Sometimes I would run *snoop* with the result being two problems. I would fix these and my next *snoop* run would have in it four problems! It doesn't matter how many times you run *snoop* or how many problems you get, you have to eliminate all problems before you run the upgrade program.

```
PROBLEM: The file system '/' does not have enough disk space to accomplish
         all of the file movements necessary for this upgrade. Make more
         room on this file system and try again.

PROBLEM: The following partially converted files are saved in /tmp. Edit
         these files to correct any problems identified in them
         (identified by a comment containing the string "analyzer"). When
         done, move the files to the directory
         /etc/upgrade/save/UH2029P1/ttools/OS-Core.d/cmds and run snoop
         again. When snoop asks if you want to convert the files again,
         say "no". See analyzer(1M) for details about comments in the
         files.
         /.profile
       * Running transition script OS-Core.10
       * Examining /etc/rc.utils file to extract the ptydaemon startup
         information.
       * Executing swinstall.
         ANALYZING FILE SYSTEMS (during SD install analysis)

PROBLEM: Too many mounted HFS file systems. The maximum number of
         file systems handled is 64.
```

The first of the problems in this *snoop* run is by far the most serious. To free up space on root you have to find unneeded files and determine what directories can be moved onto separate logical volumes. As mentioned earlier, */var* was moved to its own logical volume; this produced adequate free disk space on root to proceed with the upgrade. Also, some files were partially converted and placed in */tmp*. These files had to be analyzed and made compliant with HP-UX 10.x before this error was eliminated. There were too many mounted file systems, in this case 64. That is no longer a limitation of the upgrade tools, the limit having been increased well beyond 64.

Running snoop Again and Again

As you correct problems and address cautionary entries in */var/adm/sw/snoop.log*, you can re-run *snoop*. The first time you run *snoop* you should include the step that runs Software Distributor so you can preview the amount of disk space that will be consumed. You can subsequently run *snoop* without the Software Distributor previewing by running it with the *-a* and *-d* options:

```
# /usr/sbin/snoop -a -d
```

The *-a* runs *snoop* automatically without any interaction. The *-d* disables the Software Distributor portion of *snoop*.

8) Run *prepare* and *analyzer* Programs

snoop has taken a close look at the system and alerted us to some potential upgrade problems. What about source code, scripts, documentation, and other files on your system? You may have users with many files that need to be checked for compatibility with HP-UX 10.x. *prepare* and *analyzer* are two programs that can assist you with these files. These programs can be run a variety of different ways. *prepare* identifies programs that may need to be run through *analyzer*. You can also invoke *analyzer* with *prepare*. *analyzer* looks at ASCII files such as shell programs, source code, make files, and text files, identifying changes. *analyzer* can identify path names, commands, system calls, library routines and other aspects of files that may not run correctly or are not mapped correctly to HP-UX 10.x. The *Upgrade Manual* describes three ways to run *prepare* and *analyzer*. You use the technique that is best suited to your system layout.

Let's take an example from the T500 upgrade. Suppose you have many files you wish to evaluate. In a two-stage approach, first your files are identified and then conversion and analysis take place. To begin with we run *prepare* with the *b*, *v*, and *r* options to determine if files need conversion and analysis. *b* performs the quick check, *v* prints status to the screen, and *r* performs a recursive check. Here is what the command looks like:

```
$ /upgrade/bin/prepare -bvr /home/denise
```

The result of issuing this command is that all of the files in */home/denise* are categorized and then the files that need analysis and conversion are created. In this upgrade I ended up with the following files:

1.SHELL.g
1.SRC.g
1.TEXT.g
1.ELSE.g
1.SKIP.g

Now we can again run *prepare* and it will call *analyzer* with the following command:

```
prepare -V -l+2 -L $ -S $ -f 1.SHELL -m NEWDIR
prepare -V -l+2 -L $ -S $ -f 1.SRC -m NEWDIR
prepare -V -l+2 -L $ -S $ -f 1.TEXT -m NEWDIR
prepare -V -l+2 -L $ -S $ -f 1.ELSE -m NEWDIR
```

The *NEWDIR* specified can be any directory you want. In this case an entire hierarchy was produced under */home/denise/NEWDIR/home/denise* in which all of the files that have been run through *analyzer* appear.

Files that may need at least one change are placed in the following files, which will be used in the next phase:

1.SHELL
1.SRC
1.TEXT
1.ELSE

What has *analyzer* done? The following is an example from a root crontab file. *analyzer* has determined that */usr/spool/cron* has moved to */var/spool/cron*.

```
00,10,20,30,40,50 * * * * /usr/spool/cron/drmjobs/arch_save >> /usr/spool/cron/
                    drmjobs/logs/arch_save.log 2>&1 #Performs archive log saves
#analyzer, Line 12: Parent directory "/usr/spool/cron" has moved to "/var/spool/
                                                                        cron".
```

You can expect *prepare* and *analyzer* to run quickly for users who don't have a

large number of files that may need to be changed. For users who have many files that may require changes, *analyzer* can take hours to run. I recommend first running these tools on a small scale to get a feel for what they will produce and then using them on the users who have many files. In addition, you may want to categorize your users into those who can review the files *analyzer* has dealt with and those who don't have much HP-UX expertise and may need help reviewing the *analyzer* results.

9) Back up System

COPYUTIL is a fantastic tool. This program will make a mirror image of any disk and, should you encounter an upgrade catastrophe, you can restore the disk to its pre-upgrade state at any time. Let's say you run *upgrade* and you encounter a problem. If you don't want to proceed with the upgrade or can't proceed with the upgrade, you can run *COPYUTIL* and restore your system to its original state. I know because my upgrade failed after the HP-UX 10.x software was loaded when I ran out of inodes on the root volume as my system was coming up. This caused a disaster which in turn forced me to abort the upgrade. I used *COPYUTIL* and in two hours my 2-GByte fast and wide root volume was back in the state it had been immediately before the upgrade (what an incredible sense of relief).

Make sure you understand the On-Line Diagnostics Environment (ODE) and *COPYUTIL* before you begin the upgrade. I had a problem because the ODE manual referred to in the *Upgrade Manual* (both shown on the Flowchart) was useless: it did not cover *COPYUTIL*. It may have been an old manual, although I ordered it immediately before the upgrade. I used a simple procedure from the course material from "Upgrading to HP-UX 10.01 Hands-On Workshop."

COPYUTIL is easy to use. The backup of the root volume took less than two hours. *COPYUTIL* will scan your entire system and list tape and disk drives so you can select from all of your disks the one(s) you want to copy to tape. After booting from the support tape, you can run *ODE COPYUTIL* and issue various commands. All of your devices are listed and you can select the source and destination of your backup. The following shows the command to back up a disk that *COPYUTIL* sees as item 16 to the tape it sees as item 2:

```
BACKUP  16  2
```

Make more than one tape with *COPYUTIL* in case you have a bad tape.

10) Perform Upgrade

You have run *snoop* and eliminated all errors, so you will be able to upgrade without incident, right? Wrong! *snoop* is run in multi-user mode; */usr/sbin/upgrade* is run in single user mode. I had to leave *upgrade* several times to correct errors before I could proceed. *upgrade* does various checking and then invokes Software Distributor. You can encounter problems either before, during, or after Software Distributor is invoked.

The worst problem encountered occurred after the HP-UX 10.x software was loaded and the system was rebooting. On the way up the root file system ran out of inodes. This meant that not all of the links between the old disk device files and the new disk device files were in place. In addition, the system was in a half booted and half upgraded state. I had to use *COPYUTIL* to bring the system back to its original state and again run *upgrade*. At the time of this writing *snoop* does not check to see if you will have sufficient inodes to complete the upgrade. Although *snoop* did a great job of checking the system to ensure the upgrade would run, it did not check inodes. Since the system I was upgrading had several hundred gigabytes of disk, and all sections of all existing disk files had to be linked to new device file names, I ran out of inodes. This is why I strongly recommend you perform the inode check described earlier and free additional inodes if you are even remotely concerned about having insufficient inodes.

11) Post Upgrade Tasks

You could end up with a variety of tasks to perform when the upgrade is complete. If you were thorough when preparing for the upgrade, then you may have very few additional tasks to perform. On the T500 upgrade several volume groups were not converted when the upgrade was complete. The messages in */etc/rc.log* for several volume groups, all of which were numbered greater than 100 interestingly enough, looked like the following:

```
Mount file systems
Output from "/sbin/rc1.d/S100hfsmount start":
vgchange: Warning: Couldn't attach to the volume group
physical volume "/dev/dsk/c15t6d0"
Cross-device link
vgchange: Couldn't activate volume group "/dev/vg102":
```

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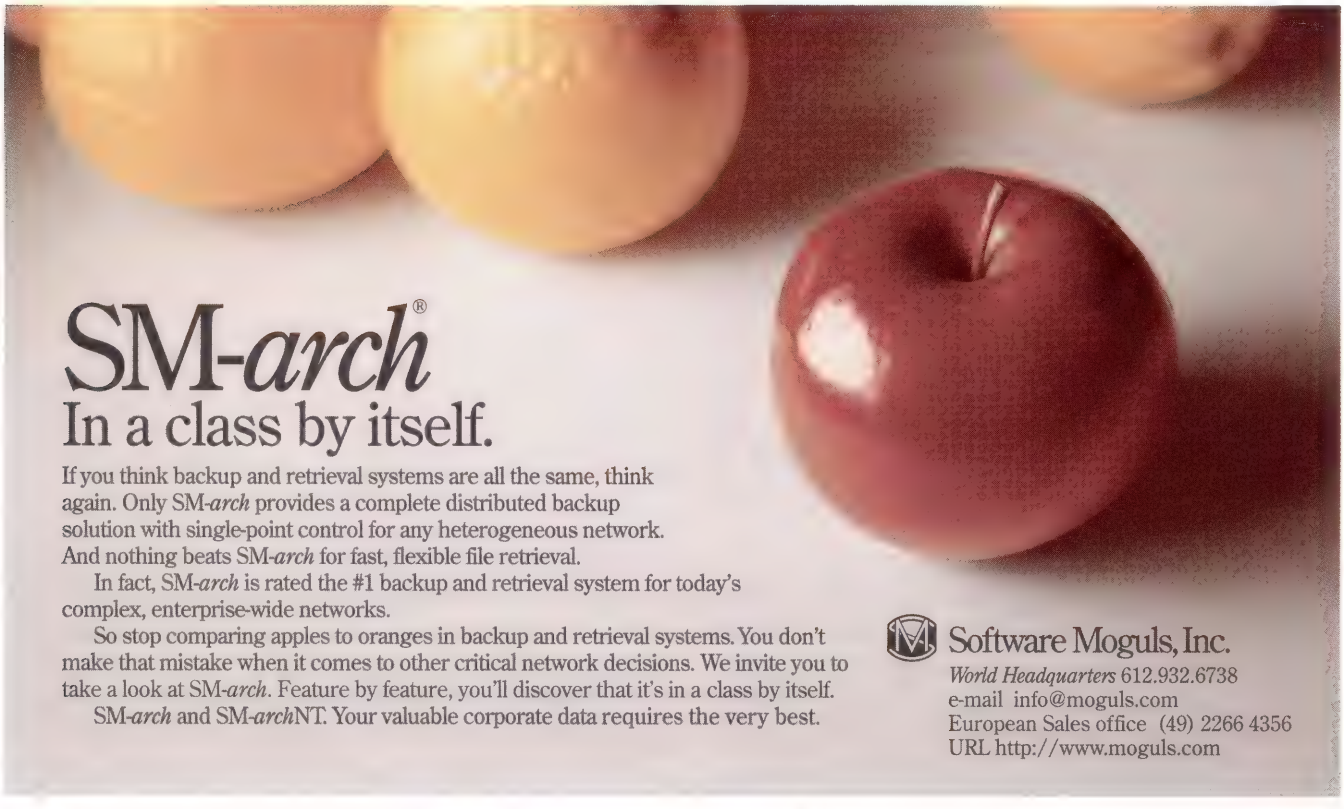
CIRCLE 110 ON READER SERVICE CARD



CIRCLE 142 ON READER SERVICE CARD

```
Quorum not present, or some physical volume(s) are missing.

vgchange: Warning: Couldn't attach to the volume group
physical volume "/dev/dsk/c15t5d0"
Cross-device link
vgchange: Couldn't activate volume group "/dev/vg105":
Quorum not present, or some physical volume(s) are missing.
```

After getting several of these ominous messages, I copied the existing */etc/lvmtab* file to */etc/lvmtab.bak* and rebuilt the *lvmtab* file using *vgscan*. I then activated the volume groups using *vgchange*. These are powerful commands I consider risky, so be sure to contact the Response Center and anyone else you can think of before you issue them. In this case the following series of commands fixed the volume group problems:

```
$ mv /etc/lvmtab /etc/lvmtab.old
$ vgscan -v
$ vgchange -a y vg102     (performed this for all
                           volume groups with errors)
```

This is a somewhat drastic step, but without these volumes groups activated, essential data was missing from the system.

Another task you will have to perform is to verify that your applications are running under 10.x. If the user files were analyzed prior to the upgrade and the applications run, then you should have few additional tasks to perform beyond backing up the new system. On the T500 upgrade we had an Oracle expert as part of the team. He mapped his Oracle startup and shutdown sequences into the HP-UX 10.x sequences. You also need to familiarize yourself with all HP-UX 10.x patches that apply to your system. There are a lot of patches, so you may want to obtain a list of available patches in advance of the upgrade and review them for their relevance to your system.

Some Additional Considerations

A fair question to ask at this point is, why hasn't this article dealt with such issues as NFS Diskless? Well, I have covered almost everything encountered during this T500 upgrade. This was not an all-encompassing upgrade, if there is such a thing. You need to make sure your upgrade planning process includes all of the characteristics of your particular environment including your system and applications. You can have a variety of special considerations peculiar to your environment that will require special attention. Since there is a lot of good material that helped me when performing the upgrade described in this article, and since HP provides many tools that assist in the upgrade procedure, I suggest you begin preparing for your upgrade now. Using the documentation, tools, and HP consulting services, you may find the upgrade an easier process than you thought. ◧

Marty Poniatowski is a technical consultant with Hewlett-Packard in the New York area working on both server and workstation installations. He has written over 50 technical articles in computer industry publications. He has also written three books published by Prentice Hall: HP-UX 10.x System Administration *(1995),* The HP-UX System Administrator's "How To" Book *(1993), and* Learning the HP-UX Operating system, *on which this article is based. All three books can be ordered by calling (203) 377-4746.*

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by Joseph Berry

WELL, I DID SOMETHING I thought I would never do. I wiped out my system without having a backup available. But I didn't just sink in a rowboat; I sank with the *Titanic*. I lost about 2 GB of data. My backup had been a second 2.4-GB disk drive that died with the first drive. The moral of the story is to use tape to back up your system even if extra disk drives are cheaper. (I won't tell you how I blew up my system. I'm too embarrassed.) Anyone who has tried without success to access my Web page this last month now knows why it doesn't exist any longer. I am slowly rebuilding it and hope to have it back up soon (perhaps by the time you actually read this column).

Not many good pieces of software have been introduced on Usenet these last two months. People are either not writing new software or not contributing any. If you are one of the latter, think about how good you would feel with many people accessing your program.

COMP.SYS.HP,HP-UX

tcpdump v 3.0

On many UNIX platforms, the program tcpdump is used to dump traffic on a network. This program is now available on HP-UX systems, too. Examples of what the program does include printing all packets arriving at or departing from a specific host; printing all IP packets longer than 576 bytes sent through a specific gateway; printing ICMP packets that are not echo requests/replies. Many additional options are available. The program can be found on *col.hp.com* in directory */dist/networking/tool* as *hp-tcpdump-3.0.tar.gz*.

Note that the program is not supported by HP. In addition, you must have streams installed on your system.

xchat

This is an interesting idea. Trident Systems, in Fairfax, Virginia, is making xchat available to the Internet community.

This program is similar in functionality to the standard UNIX 'talk' program. Xchat, however, requires no talk daemon, since all communication is performed via the X protocols. As they say, "XChat also pops up a window on the other display automatically (as long as the X server access list allows this)–there's no more searching for the desktop and window that beeped at you."

Unfortunately, you can download it only in binary form. It is available for the following platforms: Solaris 2.x (SPARC), HP-UX, SunOS 4.1.x, and IRIX 5.x. You can get the program from Trident's main Web site home page at *http://tridsys.com*.

Master System v 1.0

Although I did download this software, I have not actually used it. This is a UNIX configuration tool intended to aid the systems administrator in maintaining a large number of machines. It was developed at Rutgers University to help maintain their own systems. The software has been beta tested for the last 12 months by running it on three clusters of systems ranging from 40 to 250 UNIX machines.

The software is written in Perl (you can at least browse through this code to become very proficient in Perl). The software supports multiple architectures (HP-UX, SunOS, IRIX, Linux, OSF/1), and is easy to use, highly configurable, and centrally controlled. Quoting from the announcement, "The master system is basically a framework for running

administration programs. It generates and caches system-specific information, and makes it available to client programs (modules) via API. A few sample modules are provided in the distribution; however, one can write others easily with the API specification provided. A system administrator may already have a number of scripts used to maintain machines; these can be easily converted. The system will run *any* executable program."

The software is available from *ftp.caip.rutgers.edu* as file */pub/master/master-1.00.tar.gz.*

COMP.SOURCES.D

remind v 3.0

In a previous issue, I mentioned an alarm-type program called Xalarm. Here's a similar program that performs a number of additional functions.

Remind is a calendar/alarm program that lets you specify reminders and alarms with a versatile interpreted input language. The program also produces PostScript calendars, and can handle both the common and Hebrew calendars. I have been using a combination of xalarm and xcal for my calendar and alarming needs. I am now experimenting with this program.

Remind is available via anonymous ftp from from *ftp.doe.carleton.ca* in directory */pub/remind-3.0.* The latest version of Remind is 03.00.14. You will find both compressed as well as gzipped versions of the program.

COMP.SYS.HP

plan v 1.5.1

When it rains, it pours. If you want to try yet one more calendar program,

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CIRCLE 40 ON READER SERVICE CARD

try this one out. Plan is a Motif-based month calendar that also replaces the dual xalarm/xcal functionality. I have not tried it (enough is enough). If any reader tests both remind and plan, please let me know your conclusions about the two packages. The overview documentation states that the program supports multiuser access using an IP server program. The sources are available as

ftp://ftp.fu-berlin.de/pub/unix/graphics/plan/plan-1.5.1.tar.gz
ftp://ftp.x.org/contrib/applications/plan-1.5.1.tar.gz

COMP.UNIX.PROGRAMMER

Gnu Tutorial

Someone had posted a question about a good tutorial for the GNU gdb debugger. Shirish Karmarkar (shirish@tcs.com) responded by referencing a specific Web site. I looked at this NASA site and actually found the top to a documentation tree of all sorts of GNU documentation presented in a hyper-linked format. This site is located at *http://sunland.gsfc.nasa.gov/info/dir.html.* It includes documentation about gcc, make, flex, emacs, TeX, etc., etc.

COMP.UNIX.SOLARIS

sysadmin v 0.4.2

Many sites, even HP sites, have at least one Sun system as a part of their network. Perhaps it is being used as a router to an Internet provider or perhaps it is being used as a network analyzer. In any event, if you are not familiar with system administration functions on a Sun (using Solaris, that is), then this tool from Hungary might be for you. Solaris does not come by default with any graphical sysadmin tool such as HP's SAM. And unless you do a lot of system administration work on Sun machines, it is difficult to remember all the appropriate commands.

The software is available from Hungary. I found, however, that the ftp server was far too slow to be of practical use. A mirror site is *sunsite.kth.se.* From directory */archive/utilities/sysadmintool* get the file *sysadmtool-0.4.2.sparc.tar.Z.*

You need to uncompress and untar this file. Then enter the command

```
pkgadd -d ./ COMPsadm
```

to install the software.

MISC

ghostscript v 3.33

Amongst the utilities I find myself using at least once a week are ghostscript and ghostview. If you are a die-hard HP printer user, your experience with printer output is probably limited to PCL (printer control language) formatted files. For whatever reason, the UNIX community has unofficially adopted PostScript as the printer language of choice. One possible reason is that it is printer-independent. At home, I use an old HP LaserJet II printer with a PostScript cartridge from Adobe.

Ghostscript (gs) is a package that allows you to translate PostScript commands into display raster or even PCL commands so that your HP printer can print them. You can download the software from any GNU repository (such as *gatekeeper.dec.com* in */pub/GNU*). Compiling the software requires you to make a soft link from the UNIX makefile:

```
ln -s unix-cc.mak Makefile
```

followed by a make.

The following files must be downloaded to build gs: *ghostscript-3.33.tar.gz* (the main sources), *ghostscript-3.33jpeg.tar.gz* (a package that implements JPEG image compression and decompression), and *ghostscript-fonts-4.0.tar.gz.* The JPEG software should be unzipped and untarred within the gs source directory as the gs make will look for it.

ghostview v 1.5

While ghostscript by itself can certainly be used to display PostScript output, ghostview is a more user-friendly front-end to ghostscript that easily allows the user to manipulate the displayed PostScript image with a mouse. To show you how it is used, one would enter the command

```
ghostview myfile.ps
```

to view the PostScript file *myfile.ps.*

Compiling ghostview merely requires running xmkmf followed by make. The latest version can be found at the same

location as ghostscript. It is called *ghostview-1.5.tar.gz.*

GNU.EMACS.SOURCES

cparse v 0.4

Similar in some ways to the System V program cscope, cparse is an emacs package that uses regexp to scan a C source file for top-level definitions (functions, prototypes, variables, pre-processor stuff, etc.) and saves them in a list. As is stated in the documentation, "Once this list is created, fast searches for names can be conducted using search features. The search will scan the local file, and all include files until a prototype is discovered.

"Also included is a prototype manager which will take any function or variable definition, and tuck it away into a header file. You are walked through initial setup the first time you do this."

The program is available at *ftp.ultranet.com* in directory */pub/zappo.* The file is called *cparse-0.4.tar.gz.*

WEB PAGES

http://www.sofcom.com.au/java/

Those of you interested in a quicky introduction to the Java programming language should check out this Web site. Sofcom Distributors in Australia has begun a series of tutorials on the Java Programming Language featured in Australia's magazine, *The Australian NetGuide.* These tutorials are becoming available at this site as they are produced.

http://www.versions.com

This site offers users up-to-date information on the current versions of software as supplied by their developers. It covers all major operating systems. A database of over 40,000 products searchable by category, keyword, developer, and product name currently exists.

http://www.thecase.com/case/index.shtml

I used to think that there was no better Web site in the world than the Dilbert Web site. I was wrong. This has now become my favorite Web site. If you enjoy mysteries, especially solving them, go visit this site. Every week you'll have an opportunity to solve another first-rate mystery. ◧

Joseph Berry is a senior software developer at Landmark Systems Corporation in Vienna, Virginia. He is one of the authors of Landmark's PerformanceWorks products, PerformanceWorks/Smart Agents for UNIX. A former HP 3000 systems specialist for Hewlett-Packard, he has been in the computer industry for more than 25 years. He can be reached at joe@wayne.unix.landmark.com.

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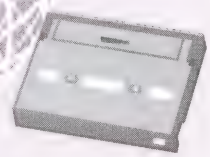

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CIRCLE 76 ON READER SERVICE CARD

X-Watch

by Larry Headlund

Redirection

PEOPLE WHO KNOW ME and my interest in magic and conjuring might think I misspelled *mis*direction, a fundamental principle of stage magic. Simple misdirection would be, "Pay no attention to that man behind the curtain!" More sophisticated misdirection would be making that same statement, knowing you will now concentrate on the man behind the curtain, instead of on the woman behind the desk who is doing all the work. That aside, we are going to talk about the redirection of stdout and stderr in a Motif program.

Why?

Why would we be messing with stdout and stderr in a Motif/X context? Certainly Motif programs can act as filters with their character-stream output piped to other programs or stored in a file. I did a couple of columns based on just that principle. What we are talking about here is the display of the standard output (or standard error) stream in a GUI window.

In a perfect world maybe we wouldn't have to think about this. There would be no legacy code and all our routines would display their information in the appropriate Motif manner. Maybe that wouldn't be so perfect. Without legacy code we would have to design, code, test, and debug all that code from scratch. Not so perfect after all.

What started me thinking about redirection and Motif programs again was a request in the newsgroup *comp.windows.x.motif/*. The poster had a program that presented many faces to the world. It had a character interface, an Athena interface, and now a Motif interface. The legacy code included libraries with thousands of *fprintf* statements for displaying information. Any recoding of those libraries was not an attractive option.

First Solution: Function Override

Since the *fprintf* function must remain, how about redefining that function? That is, you write your own *fprintf* function to display text in an XmText widget. By including the file with this new *fprintf* function in your program's load, you could have different behavior for Motif, Athena, and character versions. Simple, No?

Maybe too simple. While it would be no great feat to redefine *fprintf*, would that solve the problem? And what would the redefined *fprintf* function have to do? The new function would have to display in a Motif widget. Recall that the first argument to the *fprintf* function is the file descriptors. We would have to use the rest of the arguments to write into a character buffer using *sprintf*. The contents of that buffer would then be displayed using XmTextInsert. What to do with that first argument?

Because *fprintf* might be used in a program to write to standard out, standard error, or an arbitrary open file, the function must tailor its behavior to the first argument. If the first argument is stdout, you would write to the widget. Stderr would write to the same widget or a similar one. In all other cases the function must mimic the existing *fprintf* function. Does that about cover it? Not quite. There are other ways to write to stdout and stderr besides *fprintf*. You can use write, *fwrite*, and the ever popular *putc*, *putchar*, *putw*, and *fputc*. This means more than just some more functions to overwrite because *putc* and *putchar* are defined as macros in the header *stdio.h*. Therefore, without special modification of the *stdio.h* header file, they cannot be overridden by custom functions. You

could ensure a function call rather than a macro invocation in ANSI-C mode by enclosing the function names *putc* and *putchar* in parentheses in all invocations, but that requires the kind of re-editing we are trying to avoid! In the situation we are handling—legacy libraries with many files–that would mean special treatment for any library to be included. Anyone want to bet that this special code would be invariably used?

Because of the problems in implementation and the incompleteness of the solution, I rejected the notion of overwriting *fprintf*.

Second Solution: Letting the Shell Do the Work

Let us think about the problem from a fresh perspective. What do we want done? First, we want the output displayed as it occurs. What UNIX program does that? Why, `tail -f`, of course. Works on files or pipe input. Next, we want this output displayed in a GUI window with scrolling and the ability to iconize and all that. What do we have lying around that does that? A lot of things, including xterm, hpterm, and the CDE dtterm. Do any of these work with the program *tail*? All of them.

The original poster used this approach in his Athena program. He forked the program, launching a stem running *tail* using *execl*. He redirected the stdout and stderr of the original program to a named file and had the xterm child *tail* the output file. The process id of the xterm launching half would be saved so that the main program could kill it on exit. This seemed adequate for the Athena interface but would not suffice for the Motif version. The primary reason is that Motif programs do not take well to forking. You can fork a motif program but only if one half of the parent-child pair does absolutely no X processing. If both halves attempt X processing, they will step all over each other's memory and the result is memorable core dumps.

LISTING 1

```
#!/bin/ksh

#   Motif Wrapper: Redirect stdin and stdout
#   to an xterm

#   Arguments:
#      $2 is the program to be executed
#      All succeeding arguments are passed to $2
#
#   Note that if you exit the process with an
#   interrupt (^C) then the xterm is NOT killed
#   and the temporary file is NOT removed

OUTFILE=`mktemp`;touch $OUTFILE   # Create the output file

# set up the xterm
TITLE="Messages:"$1
xterm \
   -title   $TITLE \
   -e   tail -f   $OUTFILE \
   &
DISPLAYPID=$!      # save the xterm process number

# Start up the target process with redirection
$* >$OUTFILE 2>&1

# Below this line happens after process has finished
kill -9 $DISPLAYPID      # kill the xterm display
rm -f $OUTFILE         # remove the output file
```

I thought the problem could be avoided by having the shell do all the work. That is, I would write a shell wrapper around the program that would redirect the standard output and standard error of the program and launch an xterm to *tail* that outfit. This had several advantages in my mind. It would mean the primary program's code would not be touched, the same script could perform for any program, and the code could be contained all in one page. *Listing 1* shows the script that does this.

Third Solution: Real Motif

Sometimes you want real Motif and real widget control. If I were going to do this, what would I need?

First, someplace to display the file. I would want the display to be independent from the main program's screens, able to be iconized or positioned whereever the user wanted. Some kind of dialog widget then. All you can do with this widget is look at it or not, so there is no function for any buttons. That means an XmFormDialog,

a bare bones dialog. The only child of the dialog will be an XmText widget. More precisely, a scrolled text widget. The essential code for this is contained in a few lines, where widget toplevel is the result of a previous call to XtVaAppInitialize:

```
static Arg arg[] = { {XmNeditMode, XmMULTI_LINE_EDIT},
                     {XmNeditable, False},
                     {XmNcolumns, 80},
                     {XmNrows, 20}, };
int n =              4;
Widget w = XmCreateFormDialog( toplevel,
                               "stdout",
                               (Arg*)0,
                               0);
Widget text = XmCreateScrolledText(w, "text", arg, n);
```

Now we need to get a descriptor of that output for our use and update the widget text whenever something is added. Monitoring a file for changes and taking action is what XtAppAddInput() was designed for. We just need the descriptor for the output. I originally tried to get the descriptor directly from stdout, but this was not successful. I had to obtain it by defining an environmental variable, *OUTFILE,* and having the code open it. That means the execution of the program would look like

```
OUTFILE=`mktemp`;export OUTFILE programname >$OUTFILE 2>&1
```

Getting the file descriptor and setting up the XtAddInput() was another couple of lines:

```
int id =    open( getenv("OUTFILE"),
                  O_RDONLY | O_NOCTTY |O_NONBLOCK);
int inputId = XtAppAddInput(
              app_context,
              id,
              (XtPointer)XtInputReadMask,
              (XtInputCallbackProc)filedisplay,
              &text);
```

Now the function *filedisplay* will be called any time something is added to *OUTFILE.* What does the function *filedisplay* do? Add the increment of the file to the widget text. That is why the address of the widget text is passed as an argument. Another short scrap of code defines the function:

```
static void filedisplay(
XtPointer    client_data,
int*         source,
XtInputId*   id)
{
   char    s[128];
   int     n;
   static  intpos = 0;
   Widget  *text = (Widget*)client_data;
   (void)fflush(stdout);
   while ((n = read(*source, &s, sizeof s)) > 0) {
            XmTextInsert(*text, pos, s);
            XmUpdateDisplay(*text);
            pos += strlen(s);
            }
}
```

The only thing odd in the above is the flushing of stdout. If this is not done, since stdout is buffered, you will not get the new contents of OUTFILE as soon as they are added.

Warnings and Problems

While the above works fine, if you got massive output from the program you could have problems since the XmText widget contents keep growing and growing. But for almost every case this should be sufficient. ◧

Larry Headlund is president of Eikonal Systems and has been working with commercial UNIX since 1982 and with X since 1988. He can be reached at (617) 482-3345 or via e-mail at lmh@world.std.com.

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CIRCLE 111 ON READER SERVICE CARD

Windows 95 or Windows NT?

by Bob Combs

"SHOULD WE BE UPGRADING to Microsoft's Windows 95 or Windows NT?" That's the question that clients keep asking me. The same question that many companies are asking themselves. Everyone has heard that within a few short years Microsoft will merge Windows 95 with Windows NT. And in the press, stories abound of different companies deciding to bypass Windows 95 and go straight to Windows NT Workstation. There have even been rumors of employees of some company or other who were fired for loading Windows 95 onto their corporate PCs. (Good grief!)

So, what are the differences between the two? Why would someone choose one over the other? Let me try to answer these questions.

Windows 95 is a step forward from Windows 3.1, but not quite as large a step as Windows NT. Microsoft intended Windows 95 to be a step between 3.1 and NT, compatible with both—a migration path to Windows NT. The Windows 95 development team decided to leapfrog NT in a few features, specifically Plug and Play and the user shell interface. (NT 4.0 does provide the new shell.)

The differences between the two that I believe matter are (1) scheduling capabilities, (2) software supported, (3) file systems supported, (4) Plug and Play, (5) mobile capabilities, and (6) hardware supported.

Windows 95 is a 32-bit operating system and, like Windows NT, will run 16-bit applications too. NT uses a scheduling algorithm that gives each program an equal slice of execution time. While 95 has the same scheduling, 95 also provides a special 16-bit Windows scheduler that schedules tasks just as Windows 3.1 does. Tasks under Windows 3.1 give up the processor only when they request input/output or specifically call to give up the processor. Certain Windows 3.1 applications depend upon this scheduling scheme to operate correctly, and only 95 provides it.

Windows NT does not use .INI files at all. They can be used by legacy software that needs them, but NT doesn't even look at them. Windows 95, however, reads the .INI files at each bootup, keeping them consistent with applications and the registry. Applications that set certain .INI file values can expect them to be moved into the registry and maintained by Windows 95. This is another reason why legacy applications run more smoothly on 95 than on NT.

Windows NT supports three disk file systems: FAT, HPFS, and NTFS. FAT is the old MS-DOS file system, updated to handle long file names as well. HPFS is used by IBM's OS/2, and therefore isn't used very often in NT implementations. NTFS, on the other hand, is NT's new, exclusive file system, which is required to provide full NT security. As a rule, NTFS is the preferred file system in NT systems, and is a must if security is an issue. Windows 95 supports only FAT, including the long file names, and therefore provides relatively little system security.

Windows 95 has Plug and Play, which can automatically recognize and configure hardware devices. PCMCIA cards can be inserted while 95 is running, and it will automatically load the driver. The latest version of NT will support PCMCIA cards, but not Plug and Play. NT must still be configured and then rebooted before a new device can be used.

Both NT and 95 support remote access services (RAS), PPP, and dial-up networking. However, 95 is easier to use and contains simple wizards to install and create mobile configurations.

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CIRCLE 32 ON READER SERVICE CARD

Windows NT is available for several hardware platforms—Intel, Alpha, MIPS, and the PowerPC. Although Windows 95 is available only on Intel, 95 supports a broader array of PCs, I/O cards, and devices. You stand a much better chance of getting 95 up and running on an unusual PC than you do with NT. It is always best to check the Hardware Compatibility List (HCL) when installing either system on unusual PCs.

Microsoft has announced that the desktop environment of NT and 95 will be the same by the middle of 1996. By the end of 1996, both will support remote windows objects (distributed OLE). Major releases of the two operating systems in 1997 will bring them even closer together when both will provide Plug and Play. By 1998 NT and 95 will be entirely in synch with each other. This should mean that NT will be the dominant system by 1998.

While the resources each needs seem small to individual users, they can become costly when multiplied across an entire company or department. It is only fair that we contrast the requirements of each operating system. Windows 95 requires a minimum of 8 MB of RAM and uses 40 MB of disk, while Windows NT requires a minimum of 12 MB of RAM and uses 90 MB of disk. My experience shows that while the minimum resources work, they aren't very practical. I suggest 16 MB of RAM for Windows 95 and 20 MB of RAM for Windows NT for a comfortable system. Don't forget you'll need another 20 to 30 MB of disk space for your swap file.

So, the main reasons for using Windows 95 now instead of NT are portability, broad hardware support, and compatibility with legacy software. Windows 95 will continue to evolve in the direction of Windows NT, until the migration to NT will be fairly painless. As Microsoft paints it, we probably won't be able to tell the difference by 1998.

The reason for moving to Windows NT now might be centered more on what you *don't* care about; that is, you don't need legacy software compatibility, mobility, or unusual hardware support. But there are some good reasons to move to Windows NT immediately. Windows NT will provide system security far beyond 95, and NT supports several RISC platforms, which 95 doesn't do. ◧

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HP 1000 Guru

Q: I need to replace an eight-channel mux panel, but HP tells me it's no longer available. They recommended a newer panel and cable as a replacement. Will this work without any problem?

A: It depends on the existing cable you are replacing. Since the baud rate generator assignment is accomplished via the cable hood on the mux card, you may need to make changes to either the wiring itself or the mux intialization commands in your welcome file.

The following table shows the mux panel/cable combinations and the BRG wiring:

Panel #	Cable #	BRG wiring
12828-60001 *	12828-60002	BRG0 = Port 0 BRG1 = Port 1-7
12828-60001 *	12040-60002	BRG0 = Port 7 BRG1 = Port 0-6
28658-60005	28658-63005 or 28658-63002	BRG0 = Port 0 BRG1 = Port 1-7

** The 12828 panel has been obsoleted and is no longer supplied.*

As you can see, if you are replacing a 12828-60002 cable with a 28658-63005 cable, the BRG wiring is the same. If you are replacing a 12040-60002 cable, you will either have to change the wiring in the hooded end (card end) or perhaps modify the CN commands you use to enable your mux.

One additional comment about the 28658 mux panel: It does not supply +/- 12 Volts on pins 9/10. The 12828 panel had these voltages available, and these were occasionally used to power external, low current (less than 1 Amp) draw devices. If your application requires a low current source, you will have to make provisions for this.

Q: I have a BSD application that sends data from a 9000 to the 1000 continuously. Occasionally, the 9000 side shuts down the socket for no apparent reason. On the 1000 side I see the following in the NS Event log file:

```
Error   HP-TCP          33     0    75   161b    INPRO/0
 14011 14011 18 38 1 20101 20100 -31088 25605 -31088 25620 0
 13 -12047 11 -32294 0 2 9 21309 0 0 0 8
```

The 14011 error is a bad checksum error. What is the problem?

A: The problem is that the HP 1000 is not recognizing a 0 as a valid TCP check-

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CIRCLE 21 ON READER SERVICE CARD

sum, and as such is dropping the packet. If the packet is retransmitted with a non-zero checksum, things will be OK. It may be that the 9000 is counting dropped or unacknowledged packets, and then closing the connection after X number of these. But the real solution is a patch for INPRO on the RTE-A system that does not reject packets with a checksum of 0.

Contact the Response Center for a patch for 6.2 NS/1000.

Q: The battery backup pack in my A990 computer is no longer holding a charge. I ordered a 1420-0304 battery pack, but the pack I received is much smaller in size than the battery pack I have. What is the difference?

A: The 1420-0304 was supposedly obsoleted years ago and replaced by a new battery pack, part number 1420-0377. This new battery pack is physically larger than the old -0304 battery. Because of this, the metal cover plate was also enlarged. Either battery should work, but if the computer has the -0377 battery, it should be replaced with an -0377. If an -0304 battery is replaced with an -0377, then a larger cover plate, part number 12151-00056, must also be used. The 1420-0377 battery and cover plate (12151-00056) may be ordered as a kit, part number 5061-2545.

Q: I am using DBUTL on my RTE-A system. When I try to use the CMNDO command stack, which was new at 6.1, DBUTL aborts with a UI error. This usually means a CPU hardware or firmware problem. But only DBUTL is affected. What gives?

A: DBUTL has a problem when the command stack is utilized and you happen to be using a PC with Reflection as the terminal emulator. This problem is noted in an SR, but since the workaround (i.e., don't use Reflection, or if you do, don't use the command stack) is obvious, the SR is currently in a "no-fix" status.

Q: I am writing a C program that uses extended EMA on an A990. I am finding inconsistent results and occasionally my program will memory protect. I am using the latest 6.2 revision of RTE and the latest C compiler. Normal EMA works fine. What is wrong?

A: It turns out this is A990 Microcode bug.

C language byte pointers into *extended* EMA may not function correctly. When a C EMA byte pointer is dereferenced and used to read/write the last page of an extended EMA segment

an incorrect address is returned, resulting in a local or stack location being read/written instead of the EMA location. The problem occurs only on the A990 while using *extended* EMA/VMA and only when referencing the last page of an EMA segment. The problem occurs when using the .LBPC instruction that is emitted only by the C compiler.

The problem is caused by a defect in the .LBPC instruction in the A990 microcode. When .LBPC is requested to map in the last page of an extended EMA segment, it incorrectly returns a word address in the B register instead of the byte address. If the request is for any other page than the last page of each allocated EMA segment, the returned address is correct.

A patch for the A990 firmware is available from the Response Center. It consists of a microcode patch file which is downloaded at boot. The firmware itself will most likely not be updated, since the microcode patch accomplishes the task.

Q: I have an HP-IB DDS drive on my RTE-A. Now that I no longer have a 7970 or 9144 to boot from, I find that I cannot boot from the DDS. I get a loader error 560. Shouldn't this work?

A: Yes this should work. The only requirements are the following

1. VCP firmware revision must be 4020 or greater. This can be determined by looking at the B register from VCP at power up or after a %T command.
2. The address switch on the DDS drive must be set to "8" and the tape then booted as address 3. For example, %BMT3027. Setting the address switch to 8 causes the DDS drive to identify itself as a 7980 tape, which allows VCP to boot successfully.

Q: I attempted to upgrade my RTE-A system from 5.27 to 6.2 and ran into several problems. Can this be done? The *6.2 Communicator* makes no mention of this.

A:. Yes it can be done. The major problem is the new utility KTEST, which is required by the installation command files. If KTEST does not exist, RTE_INSTALL will load it. The problem arises on pre 6.0 systems. KTEST does not execute properly, and renders the subsequent installation command files unable to function.

The solution involves generating and then booting a minimum 6.2 system, and then using that system to install the entire RTE-A/VCPLUS programs using RTE_INSTALL. This minimum 6.2 system needs the following programs:

D.RTR	CI	CIX	KTEST	ASK
LINK	DERR	LINDX	MERGE	MPACK

DL and LI are also useful.

A complete cookbook is available that describes all steps necessary to update a system from 5.27 to 6.2. It contains excerpts from all relevant *Communicators*. The cookbook is described in Support Line in document ID: SWT960515001 and is available via e-mail. To obtain a copy of the cookbook send e-mail to: *Rte_Support@hpwrcxe.mayfield.hp.com* Make the Subject: Cookbook Request. A copy will be e-mailed directly to you. ◧

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CIRCLE 140 ON READER SERVICE CARD

CSL Perspective

ONE OF THE MORE enjoyable roles that I occasionally undertake is that of teacher and mentor. Very early in my career, I was spending a large portion of my work week in overseeing the work of college co-ops and new employees. It is not entirely surprising to find me playing this role considering that I'm a "TK"—a teacher's Kid. Most of my early life was spent around education in one form or another. I have always had an insatiable appetite for learning and reading, and especially for technical things. I admit that sometimes I can get rather carried away with new technologies or finally understanding something I may have read years previously. I also find a measure of personal satisfaction in sharing what I've learned. We call it "technology transfer" and it is an integral part of our jobs, part of being a team player.

Sometimes I fall into the tech transfer role without even realizing it. A case in point is an incident that occurred early one morning while I was changing tapes on one of our systems. Sitting at a workstation was a developer I had not seen around before that day. He turned from his work, introduced himself and then asked me a little about the systems in the room. What were they used for, who was developing on them, and what role did I play. Somewhere in the course of conversation, I learned that he was an engineering student at my alma mater. We reminisced about all the changes that had occurred on campus over 15 years and then he asked, "What does it take to be a UNIX system administrator?"

I have to admit that I was a bit taken aback by the question since I had never really considered what it took. I started to think in terms of degree majors (computer science) or other courses, but I quickly realized that that would be insufficient. It gave me cause to look back at my own experiences and decisions and come up with some realistic recommendations for this interested student. Permit me to share some of these insights with you.

In setting the stage for our discussion, let's define the role of system administrator as one whose primary responsibility is to ensure an available, reliable, and capable computing environment for his or her users. With more and more business critical applications being run on UNIX platforms, expectations are running pretty high. The successful administrator will keep these three points in mind, constantly looking for ways to improve both the environment as well as the services it offers to users. Further let's assume that there is a minimal skill set one must possess in order to be a functional administrator and that with time, experience, and further training, an individual can develop more complete skills in various areas as well as expand his experience base into less common areas.

The skills can be broken into three categories:

1. Technical Skills
2. Soft Skills
3. Personality Characteristics

Technical Skills:

Programming Skills: Familiarity with algorithm design, data structures, testing techniques, and a high-level language. Also some experience with program development tools such as *make* are very useful.

Trouble Shooting: Skills in problem analysis and characterization, and ability to formulate action recommendations

and plans.

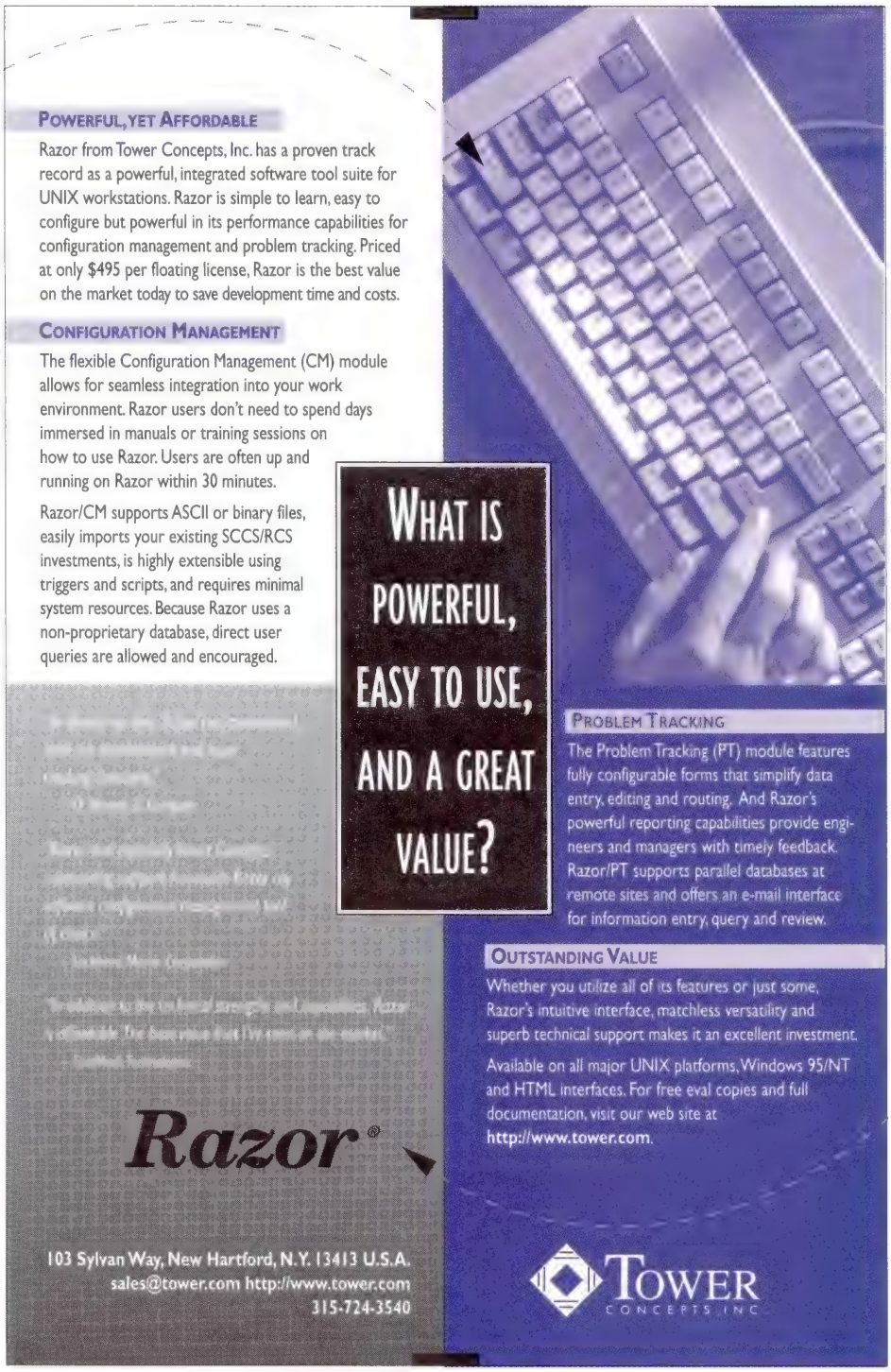
On-Line skills: Ability to use basic editor functions to perform routine tasks (on most systems this means vi or EMACS). Knowledge and experience in dealing with most of the commands and utilities. A key skill is the ability to use I/O redirection and pipes to build complex command flows.

Operating Systems: Familiarity with OS subsystems at a subsystem level (i.e., I/O, memory management, scheduling, disk I/O). Detailed internals knowledge is helpful for those who provide performance analysis and tuning services on a regular basis.

Networking: Understanding of common media (Ethernet, FDDI), experience with basic services and protocols (telnet, ftp, 'r' commands, http, e-mail). Familiarity with NIS and/or DNS if used at a site is very helpful.

I would like to continue the discussion around the remaining skill sets in my next column. In the mean time, I would be interested in some feedback on these skills. If I've missed something or you think some of these areas need expansion, drop me a note. ◧

Paul Gerwitz is chairman of the CSL committee and is a technology specialist at Eastman Kodak Company in Rochester NY. He can be reached at 716-477-3067 or e-mail at gerwitz@interex.org or gerwitz@kodak.com



CIRCLE 42 ON READER SERVICE CARD

New Products

New from Software Partners

Internet Backup Service

SOFTWARE PARTNERS/32, INC. has announced SafetyPosit, a software-based service that enables Internet Service Providers (ISPs) and Off-site Storage Providers (OSPs) to offer data backup services across the Internet.

Off-site Storage Providers typically offer pickup and delivery services to help systems administrators manage off-site backup tapes. As a SafetyPosit Reseller, an ISP or OSP can offer the SafetyPosit service to its user base. The ISP/OSP markets the service and administers the monthly billing while Software Partners operates the storage site and handles all operational details. SafetyPosit Resellers earn a monthly fee for marketing and billing plus 25 percent of the service revenue.

A second program allows an ISP/OSP to become a SafetyPosit Licensee and operate its own service. Under this program, Software Partners provides all necessary software as well as consulting on system configuration and operational procedures. Under the licensing arrangement, the ISP/OSP pays Software Partners a royalty equal to 10 percent of the revenue generated.

Windows NT Backup

SOFTWARE PARTNERS/32, INC. has announced the addition of Windows NT to StorageCenter, storage management software for distributed computing. It features four tightly integrated applications: (1) Backup and Restore, (2) Media Management, (3) Archiving, and (4) Administration. StorageCenter supports HP-UX and other UNIX platforms.

Release 2.3 of StorageCenter adds the ability for Windows NT workstations or servers to back up to any of the supported platforms. Release 2.3 also offers a desktop Management Console under Windows NT, allowing data center managers to manage their enterprise storage from a desktop PC. StorageCenter offers complete backup for NT file systems, including security attributes that some backup systems overlook.

StorageCenter for the enterprise starts at $6,250, and for workgroups starts at $1,875. Support for NT systems, added in increments of 5 or 10 CPUs, is priced at $1,500 and $2,500, respectively. The Windows NT Management Console is $595.

Contact Software Partners, phone: (508) 887-6409, fax: (508) 887-3680, e-mail: info@softwarepartners.com, http://www.softwarepartners.com.

COBOL Application Migration

Unidata, Inc. has announced Version 2.1 of COBOL Direct Connect, designed for extending the life and utility of existing legacy COBOL applications.

COBOL Direct Connect brings Unidata's "nested" relational database management system to existing COBOL applications. It can migrate COBOL applications and associated indexed file structures to open systems without significant data file restructuring, code reengineering, or performance penalty.

The product currently supports COBOL code running RM/COBOL, Micro Focus COBOL, and Acucobol. It is available on HP-UX and other UNIX systems.

Unidata estimates that companies choosing an incremental migration path revolving around COBOL Direct Connect can achieve performance improvements of 4 to 10 times over what could be achieved with applications rewritten with embedded SQL. Once stored in UniData

when IEM has risk-free solutions for a lights-out environment

Alexandria Network Backup Librarian

Alexandria supervises every facet of your heterogeneous UNIX network backup:

- Organizes and automates your system backups
- Manages all of your backup media
- Can back up your entire network, even if it consists of several UNIX platforms
- Performs cold database backups of Oracle, Sybase and Informix databases
- Performs hot backups of Oracle databases with an additional module

Vantage Console Access Technology

- Consolidates control of a variety of systems and other resources (such as printers and terminal emulators) over a LAN or WAN to a single HP 9000/700 workstation
- Monitors console traffic in real time, responding to pre-defined events with visual or auditory alerts, or through third-party or user-defined applications such as email or paging software
- Allows management of resources to be transferred between different Vantage workstations on the network

Tape Libraries

DLT libraries

- 3 MB/sec drive transfer rate
- up to 9 DLT4000 drives for 97.2 GB/hour library throughput
- 28 to 264 cartridges for 10.56 TB library capacity
- one-year on-site service included

8mm Mammoth libraries

- 6 MB/sec drive transfer rate
- up to 4 Mammoth drives for 86.4 GB/hour library throughput
- up to 80 cartridges for 3200 GB library capacity

4mm & 8mm carousel libraries

- 1 MB/sec drive transfer rate
- up to 4 DDS-2 or 8505XL drives for 14.4 GB/hour library throughput
- library capacity up to 480 GB (4mm) or 560 GB (8mm)
- touch screen interface

Transfer rates and capacities given for all libraries are with a 2:1 compression ratio.

IEM: Providing Solutions for a Lights-out Environment

IEM

In the U.S. and Canada:
IEM, Inc., P.O. Box 1889
Fort Collins, CO 80522 USA
Phone: (970) 221-3005
(800) 321-4671
Fax: (970) 221-1909

In the United Kingdom:
IEM, Inc., Unit 6, Salisbury House,
Wheatfield Way, Hinckley Fields,
Hinckley, Leicester LE10 1YG
Phone: +44 (0)1455 239000
Fax: +44 (0)1455 239668

All others:
IEM International Sales
1629 Blue Spruce Drive
Fort Collins, CO 80524 USA
Phone: +[1] 970-221-3005
Fax: +[1] 970-221-1909

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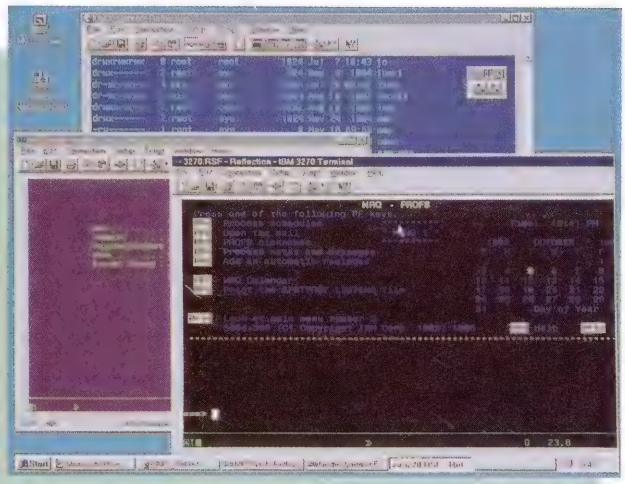
email: info@iem.com

http://www.iem.com

CIRCLE 16 ON READER SERVICE CARD



WRQ, Reflection Suite for the Enterprise

Universal Client

WRQ has announced Reflection Suite for the Enterprise Version 6.5, which includes Windows 95 and Windows NT support, improved TCP/IP and SNA support in IBM host environments, and WRQ's enterprise-capable Windows 95 TCP/IP stack and kernel-level TCP/IP applications.

Reflection's new setup engine tightly integrates the installation of the entire suite. The IS manager can create a standard or custom installation configuration and roll it out across groups, departments, or the entire enterprise, completely unattended.

For added security, Reflection Suite for the Enterprise now has SOCKS support. The telnet, Web browser, finger, and FTP applications in the suite are SOCKS clients for firewalls that have SOCKS server capabilities.

Each Reflection application works on either 32-bit operating system and automatically assumes the user interface of the operating system on which it is running. WRQ designed and extensively tested these applications to take advantage of the new features in each operating system, such as long file names and multithreading.

Reflection Suite for the Enterprise Version 6.5 is priced starting at $449 for a single-user copy. Volume and site license pricing apply. WRQ technical support is included.

Contact WRQ, phone: (800) 872-2829 or (206) 217-7100, fax: (206) 217-0293, e-mail: info@wrq.com.

RDBMS, legacy COBOL applications can benefit from a rich application development environment and database interoperability products.

Contact Unidata, phone: (303) 294-0800, fax: (303) 293-8880, Internet: unidata@unidata.com.

New from HP

Visualize Workstations

HP has introduced its PA-8000-based HP VISUALIZE graphics workstations, which reportedly boast the world's fastest compute performance (up to 20.2 SPECfp95 and 11.8 SPECint95) and the world's fastest 2-D/3-D graphics performance (up to 425 PLBsurf, 400 PLBwire, and 36.1 Xmark93). HP also announced significant price reductions on its existing desktop workstations and HP VISUALIZE graphics products.

The HP VISUALIZE Model C180-XP, priced from $50,000, delivers industry-leading desktop compute performance and the industry's fastest desktop 3-D graphics performance. The HP VISUALIZE Model C160, with a base price of $24,000, delivers compute performance of 16.3 SPECfp95 and 10.4 SPECint95 and supports the 2-D and 3-D HP VISUALIZE-EG, -8, -24, -48, and -IVX graphics.

The HP VISUALIZE Model C180-XP and HP VISUALIZE Model C160 include 12 memory slots for memory expansion up to 768 MB; up to 6.0 GB of internal disk space; four optional expansion slots for GSC, EISA, and PCI; high-speed 20-MB fast/wide SCSI-2 disk; 960-MB/s peak and 768-MB sustained processor bus memory bandwidth for maximum throughput; and Ethernet networking and 16-bit CD-quality audio.

Both workstations run HP-UX 10.20. Existing Model C100 and Model C110 customers can upgrade to HP VISUALIZE Model C160 or HP VISUALIZE Model C180-XP systems with a simple board upgrade. HP currently is offering a special upgrade promotion that enables Model C110 customers to upgrade to the HP VISUALIZE Model C160 for $7,000.

Windows NT Application Access

HP and Insignia Solutions have announced that HP will offer Insignia's NTRIGUE to customers looking for an NT-based solution. The NTRIGUE Windows NT application server has been enhanced to provide seamless interoperability with the HP environment.

Insignia's NTRIGUE is a complementary offering to the HP 500 Windows Application Server, which allows DOS and Windows applications to run in native mode on the server and display on heterogeneous UNIX system workstations and X terminals. NTRIGUE delivers Windows 95, Windows NT, and Windows 3.x applications to all enterprise desktops, including UNIX workstations, X terminals, PCs, and Macintosh computers.

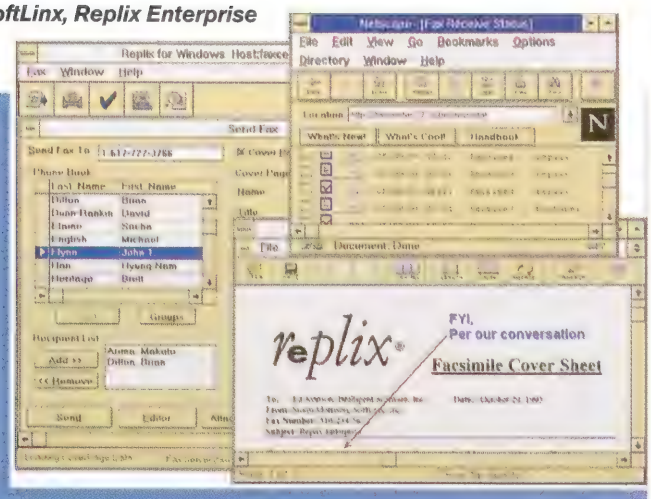
The NIS import feature provides a significant savings in installation and deployment time by allowing HP-UX Network Information Services data to

be imported, minimizing the need for manual entry of individual user information. The new faster, smaller X-driver speeds performance up to 35 percent. Network plug-and-play eliminates time-consuming network setup and offers the easiest way to connect user desktops to NTRIGUE servers.

The NTRIGUE Windows application server is available through Insignia Solutions' direct sales force and its reseller partners. It is $1,995 for five concurrent sessions.

To order, call 1-800-848-7677.

SoftLinx, Replix Enterprise



Enterprise Fax

SoftLinx, Inc. has introduced the Replix Enterprise, a World Wide Web based fax server targeted for major corporations. The Replix Enterprise is a highly scaleable wide-area fax management system for companies looking to dramatically reduce fax transmission cost, increase workgroup productivity, and control mission-critical fax messaging.

The Replix Enterprise can be configured for a single department installation to a multi-site, fault-tolerant configuration and is available on major UNIX workstations including HP 9000s. Based on open, modular architecture, the product exploits client-server, Internet, and World Wide Web technology to provide centralized and remote administration, high availability, and Internet fax routing capabilities. The system allows users to send, receive, view, annotate, and archive fax documents and supports multiple file formats, fax scheduling based on time and priority, fax mailboxes, e-mail to fax integration, remote fax retrieval, private and public phone books, and cover pages.

Contact SoftLinx, phone: (800) 899-7724 or (508) 392-0001, fax: (508) 392-9009, e-mail: sales@softlinx.com, Web: http://www.softlinx.com.

Entry-Level Servers

HP has announced new HP 9000 D-Class enterprise servers and added a new RAID product to its storage portfolio—HP Disk Array with AutoRAID. The new enterprise servers—Models D260 and D360—offer a performance increase of more than 60 percent over previous HP servers and are powered by two large-cache PA-7200 CPUs, surpassing high-end PC servers and entry-level UNIX servers. The new D-Class servers are slated to be field upgradable to the PA-8000 processor.

The HP 9000 server product line is the first UNIX system to incorporate HP AutoRAID technology. Intended for entry-level and midrange systems, HP Disk Array with AutoRAID includes ease-of-use and fault-resilient features, as well as self-optimizing performance and online self-configuration capabilities.

The new D-Class servers include CPU failover protection, automatic memory-page de-allocation, online hot-plugging of internal disk, soft power-off, and a multichannel input/output subsystem for higher throughput.

The HP 9000 D-Class servers also incorporate HP's advanced 960-MB runway processor memory bus and support up to 1.5 GB of memory, 5 terabytes of disk storage, up to 12-way memory interleaving, eight expansion slots, and aggregate I/O bandwidth of 320 MB per second. The new servers are fully binary-compatible with all other HP 9000 servers. Pricing for the HP 9000 D260 begins at $33,590 and includes two PA-7200 processors, 128 MB of memory, 2 GB of internal disk, a SCSI-2 interface, a CD-ROM drive, LAN interfaces, and a client-server HP-UX 10.01 license.

Internet/Intranet Tools for Engineers

HP has announced software products and services aimed at dissolving the barriers to information access that have limited engineers in product design and manufacturing. HP's technical enterprise connectivity software products introduced include HP MPower Web, a desktop user environment that provides easy, reliable information sharing throughout the technical enterprise, and Information Access Engine, which enables and supports global information access. Its architecture supports an open environment, permitting customers to leverage their choice of Web servers to access existing islands of information.

Together, the HP MPower Web and Information Access Engine help harness the World Wide Web to help engineers efficiently locate, "visualize," and share large-model data formats throughout the technical enterprise. These tools fully support existing HP workstations, servers, and X terminals. Support for Windows NT and other UNIX platforms is planned.

HP MPower Web is available on CD ROM for $50. Beginning in the fourth quarter of 1996, the software is slated to be preloaded on all technical workstations at no additional charge.

OpenView Event Correlation

HP has introduced HP OpenView Event Correlation Services (ECS), a new high-speed event correlation solution

Optical Disk Drives

Concorde Technologies, Inc. has announced new high-capacity 5.25-inch optical-disk jukeboxes using, fast, new 2.6-GB capacity magneto-optical (MO) disk drives. The new 3,000 rpm third-generation optical drives feature read and write speeds that are twice as fast as previous-generation MO drives.

The new optical drive family consists of a 2.6 GB table-top model and four optical library (jukebox) systems with capacities of 41.6 GB, 83.2 GB, 166.4 GB, 197.6 GB, 332.9 GB, and 618.8 GB. All models include a SCSI interface and provide support for all major UNIX computer platforms and operating systems (including HP). The optical library versions include from four to twelve optical drives, along with robotics for swapping optical media. All models support all major optical industry standards. On-site maintenance service is available in addition to the standard one-year warranty.

Prices range from $2,950 to $93,500.

Contact Concorde Technologies, phone: (619) 536-5500, fax: (619) 566-4396.

Concorde Technologies, optical-disk jukeboxes

for telecommunications management network (TMN) environments. ECS is designed to eliminate the resource overload caused by event storms.

Management systems are now able to take control of event storms by correlating hundreds of events per second and are able to reduce tens of thousands of events to just the few that are most useful and relevant to a network operator. In addition, HP announced enhancements to HP OpenView Distributed Management (DM), including HP OpenView Open Platform Interface (OPI), a new developers kit for integrating new and legacy APIs, services, and protocols.

Event storms are made up of large numbers of events or alarms flooding the network over a short period of time. HP's ECS eliminates operator overload by rapidly correlating and converting large streams of events, typically containing a lot of redundant information, into smaller, more relevant and meaningful streams of events.

The HP OpenView OPI enables OEMs to integrate new, custom, and legacy APIs, services, and protocols into a TMN platform. OEMs can use this new developers kit to extend the functionality of HP's DM platform while still taking full advantage of core DM services.

HP OpenView ECS is priced at $8,000.

Surface and Solid Modeling

Ricoh Corporation's Software Research Center is offering free evaluation copies of its DESIGNBASE Version 5.1 surface and solid modeling toolkit to companies developing in-house and commercial CAD/CAM systems for UNIX workstations and PCs with Windows NT. The latest version of the object-oriented package provides enhanced feature operations, rounding functions that blend laterally interfacing fillets and rounds, and other advanced modeling capabilities.

These capabilities add to Ricoh's previously announced Meta-Modeling technology, which enables unlimited undo/redo, point and click, GO TO, and cut-and-paste operation sequences graphically displayed as a schematic history tree. The approach lets users quickly and efficiently build and change solid models by storing and manipulating sequences of modeling operations. The schematic history feature also serves as a foundation for constraint-based solid modeling.

HP-UX is among the supported UNIX platforms.

Contact Ricoh Corporation, phone: (408) 954-5464, fax: (408) 954-5466.

Web Page Development

ObjectSpace, Inc. has announced Web<ToolKit>, a new ANSI/ISO-compatible C++ class library that supports HTML page creation. It uses a set of C++ classes representing HTML elements, including text, links, graphics, tables, forms, frames, and widgets. Without any knowledge of HTML, developers can build Web applications using tools already familiar to C++ object-oriented programmers. A company wanting to display information from a constantly changing data source onto an Internet or intranet Web server could use Web<ToolKit> to eliminate hand-coding HTML elements.

Web<ToolKit> is $349 for PC platforms and $475 for UNIX platforms. Special bundled pricing is available with STL<ToolKit>, ObjectSpace's imple-

mentation of the Standard Template Library, and with Systems<ToolKit>, ObjectSpace's second-generation C++ toolkit.

Contact ObjectSpace, phone: (214) 934-2496, fax: (214) 663-9100, e-mail: info@objectspace.com, http://www.objectspace.com.

Web-Based Database

MountainNet, Inc. has announced MOREplus for the creation, structuring, and customization of corporation information holdings available over the Web.

MOREplus is a commercial spin-off of the Multi-media-Oriented [Software] Reuse Environment (MORE), which was designed and built by a joint effort between NASA Johnson Space Center, University of Houston at Clear Lake (UHCL), and MountainNet.

MOREplus functions as an electronic library system for descriptive data about information holdings and a system for hypertext links to the holdings themselves. It stores information about holdings rather than the holdings themselves in its underlying database. End users can use this descriptive information to identify and browse promising holdings and acquire the actual holdings through clicking on their hypertext links.

MOREplus is implemented as a set of CGI executables that operate in conjunction with hypertext servers. It runs on HP-UX and other UNIX systems.

MOREplus can be licensed for $20,000, including maintenance, support, and upgrades for one year.

Contact MountainNet, phone: (800) 444-1458 or (304) 594-9075, fax: (304) 594-9088, e-mail: moreplus@mountain.net.

CIRCLE 4 ON READER SERVICE CARD

Data Clustering Engine

Search Software America has announced the Data Clustering Engine, software designed to analyze and group diverse data records into "clusters" of related records. The data is clustered despite mistakes in spelling or other variations inherent in the data. The product can help to eliminate duplicate records or identify various relationships between records. It can also be used for "data mining" for customer information, marketing, or fraud investigation systems.

Data can be grouped according to user-defined rules such as groups of the same person, or same address, company name, or account number. The product uses its own high-performance database, which can access data from any of the popular databases.

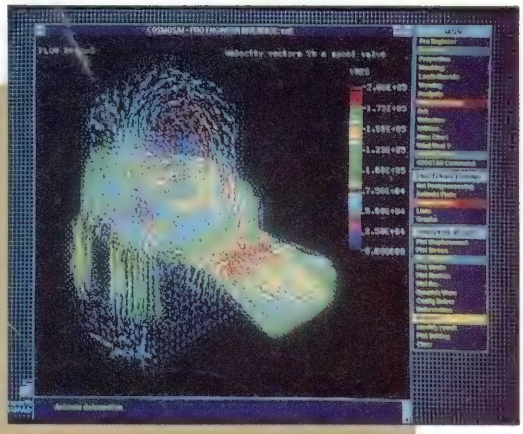
The product is used in conjunction with SSA-NAME, a name-search and matching tool. The price for a license for SSA-NAME and the Data Clustering Engine ranges from $52,500 to $142,500. The product is currently available for UNIX, Windows NT, and other platforms.

Contact Search Software America, phone: (203) 698-2399, fax: (203) 698-2409.

Network Firewall Anti-Virus Software

McAfee has announced WebShield, reportedly the first secure anti-virus software solution for network firewalls and Internet gateways. WebShield is the companion product to WebScan, McAfee's anti-virus scanner for Web browsers.

WebShield software leverages McAfee's anti-virus scanning technology to give complete protection against virus-infected SMTP, FTP, and HTTP traffic on a TCP/IP network. WebShield's anti-virus detection can be easily updated each month with McAfee's virus signature



Structural Research & Analysis, COSMOS/M Engineer

CAD Analyst Support

Structural Research & Analysis Corporation has announced COSMOS/M ENGINEER and the COSMOS/M CAD Interface Version 1.75, featuring support for FLOWPLUS turbulent fluid analysis as well as several major enhancements.

COSMOS/M ENGINEER provides a seamless interface between Parametric Technology Corporation's Pro/ENGINEER and COSMOS/M and COSMOS/FFE (Fast Finite Element) analysis software. The COSMOS/M CAD Interface offers sophisticated analysis support to a variety of leading CAD packages that include CADDS5, Unigraphics, MicroStation Modeler, and CATIA.

FLOWPLUS is available as an add-on feature for all configurations of COSMOS/M ENGINEER and the CAD Interface at an additional $6,000 for Windows NT and 95 versions and $10,000 for UNIX versions.

COSMOS/M ENGINEER and the CAD Interface are available in Basic, Intermediate, and Advanced configurations.

Contact Structural Research & Analysis, phone: (310) 207-2800.

updates, which provide protection against the estimated 200 new viruses that are discovered each month.

WebShield resides independent of the network firewall and uses a dual-home architecture, which uses two network interface cards and provides an added barrier to potentially infected traffic. All network traffic is scanned between the cards, alerting administrators to any detected viruses.

The product supports most TCP/IP Internet gateway environments, including Windows NT, NetWare, and HP-UX. A WebShield subscription license, which provides two years of free updates and supports, is priced at $3,995.

Contact McAfee, phone: (408) 988-3832, fax: (408) 970-9727, http://www.mcafee.com.

3D Developer's Toolkit

Portable Graphics, Inc. has announced that it is now shipping Open Inventor 2.1.1 for Windows NT and Windows 95. Developed by Silicon Graphics, Inc. and licensed to Portable Graphics, Open Inventor is an object-oriented toolkit for developing software based on the OpenGL API. Portable Graphics' implementation of the toolkit retains the function and features of the UNIX version, while providing a traditional Windows programming environment.

Portable Graphics optimized and extended Open Inventor 2.1.1 in several ways. The new SoMFC Library enables application development within the Windows environment. Three newly extended MFC OLE classes enable creation of an OLE 2.0 full server. With the WinSoXt Library developers can write Inventor applications without window-system dependencies. The Component library provides pre-built interface nodes that can be plugged in for instantaneous features, such as a color editor box.

Development licenses are priced at $995.

Contact Portable Graphics, Inc., phone: (512) 719-8000, e-mail: info@portable.com, http://www.portable.com.

System Integration

toolbox has announced tbop! software, a Windows-based tool for client-server system control on one or more HP-UX CPUs. tbop! uses a standard telnet connection to the HP 9000. tbop! handles spoolfile management, printer control, checking of interactive and background processes, checking of disk space usage, and more. Each of these main functions is linked to a button. tbop! allows experienced operators to concentrate on the difficult exceptions.

Via a pull-down menu, sessions and jobs can be changed or deleted. The used and available disk space on the HP 9000 is presented in graphics. Often-used commands can be saved and activated over a pull-down menu.

tbop! integrates other hosts and servers simultaneously on one workstation. It runs on Windows 3.1, 3.11, 95, and NT and manages HP 9000, HP 3000, and NetWare servers.

tbop! pricing starts at $1,500 for one CPU, regardless of the number of workstations. A free demo is available.

Contact toolbox, phone: (+49) 40 552 68 43, fax: (+49) 40 552 69 53, e-mail: 100024.2477@compuserve.com.

CD-R Autoloader

Young Minds, Inc. (YMi) and MediaForm have announced a new low-cost CD-R disc autoloader that works with UNIX, Windows, and NetWare CD recording software.

The CD-2500, manufactured by MediaForm, works with both 2x and 4x internal CD-Recordable drives and allows users to load up to 25 blank CD-R discs into the CD-2500 and then sequentially record these discs without the need for any additional operator

CIRCLE 59 ON READER SERVICE CARD

intervention. Young Minds provides CD recording software that integrates both the CD-2500 and the CD-Recordable drives into UNIX, Windows, and NetWare environments.

Young Minds has added support for the CD-2500 to its CD Studio UNIX-based CD-Recording solution. CD Studio is available for virtually every popular UNIX environment, including HP-UX. In addition to CD Studio, support has also been added to AutoCDR, a NetWare-based CD-Recording solution, and to SimpliCD, Young Minds' Windows-based software.

Contact Young Minds, phone: (800) YMI-4YMI (964-4964), fax: (909) 798-0488, e-mail: marketing@ymi.com, http://www.ymi.com.

NFS Product

Century Software, Inc. has announced the high-performance file and printer sharing network utility Simply[NFS]. The product's Network File System (NFS) protocol allows users to share applications, information, and peripherals such as CD-ROMs, backup devices, and printers located on a server or another workstation—all of which appear to be directly connected to the user's desktop PC.

The setup program automates the installation process, and in less than five minutes from out of the box a user can begin sharing and accessing networked information. Simply[NFS] provides 32-bit NFS VxD NFS client and server applications. In addition, it works seamlessly with MS-TCP/IP for Windows 95 users and includes its own VxD TCP/IP for Windows 3.1 users. Century's TCP/IP stack is a fast, 32-bit kernel that supports both network and dialup connections, allows for multi-threaded access, and uses no conventional memory.

Simply[NFS] starts at $179 per user.

Contact Century Software, phone: (800) 877-3088 or (801) 268-3088, fax: (801) 268-2772, e-mail: sales@censoft.com.

Windows NT Testing Solution

SQA, Inc. has announced SQA Suite 5, reportedly the first testing solution for Windows NT and Windows 95 that includes a scalable, client-server test repository. In addition, SQA Suite 5 has extended its Object Testing technology to now test 32-bit components such as ActiveX controls, OLE Controls (OCXs), Win32 controls, and 32-bit PowerBuilder objects.

SQA Suite 5 is comprised of three leading-edge products from SQA—SQA Robot 5, SQA Manager 5, and SQA LoadTest5—and is based on a formal test methodology to deliver a single, integrated solution for testing cross-Windows client-server applications. All of the products in SQA Suite 5 have been completely implemented as 32-bit applications on Windows NT and Windows 95.

The products in SQA Suite 5 can be purchased separately ($2,495 per user for SQA Robot 5 and $1,295 per user for SQA Manager 5; SQA LoadTest 5 ranges from $10,000 to $37,500) or in two bundled editions: SQA Suite: TeamTest Edition for $2,995 per user, which includes SQA Robot and SQA Manager; and SQA Suite: Client/Server Edition starting at $12,395, which includes SQA Robot, SQA Manager, and SQA LoadTest.

Contact SQA, phone: (617) 932-0110, fax: (617) 932-3280, http://www.sqa.com.

Backup and HSM Software

ATL Products Inc. has announced that HP's OpenView program has extended its support for ATL's automated tape

OO Design and Reengineering

Advanced Software Technologies, Inc. has announced Graphical Designer Version 2.0. Version 2.0 features the Graphical Designer products GDProPlus, GDPro, and GDDraw. Also new with Version 2.0 is support for PCs running Windows 95 and Windows NT. Prior to Version 2.0, Graphical Designer was a UNIX-only product.

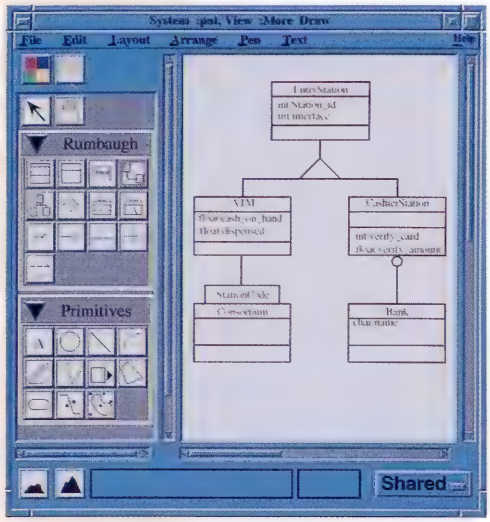
GDProPlus and GDPro give professional developers the ability to create object-oriented software designs. They support a wide range of popular object-oriented design methodologies, including Rumbaugh, Booch, Unified, and Use Cases. GDProPlus not only supports existing OO design methodologies, but it also features true meta-CASE capabilities, which let developers create customized OO design methods.

GDProPlus and GDPro generate source code for all supported design methodologies in one or more languages, including C++, C, and Java. GDDraw dramatically speeds the process of drawing technical diagrams by providing a variety of predefined templates.

The product supports HP-UX and other UNIX workstations. GDDraw pricing starts at $995 for the UNIX version and $495 for Windows 95 or NT. GDProPlus pricing starts at $8,995 for the UNIX version and $3,495 for either Windows version. GDPro pricing starts at $3,495 for the UNIX version and $995 for either Windows version.

Contact Advanced Software Technologies, phone: (303) 730-7981, fax: (303) 730-7983, e-mail: info@advancedsw.com.

Advanced Software Technologies, Graphical Designer



library technology with new releases of the HP OpenView's backup and hierarchical storage management software.

HP OpenView's new version of OmniBack II A.02.00 includes support for the barcode identification feature in the ACL4/52, providing fully automated media management functions. OmniBack II A.02.00 also facilitates control of the automated input/output port, allowing network administrators to more easily add or remove a single tape cartridge without opening the entire library. In addition, the newly released version of OmniBack II adds full support of ACL4/52's automatic drive cleaning feature.

Containing four powerful Quantum DLT 4000 high-performance tape drives, the ACL4/52 contains 52 cartridges of 20 GB each, for a total capacity of more than one terabyte. Each of the four DLT drives supports a sustained data transfer rate of 1.5 MB per second in native mode. With hardware data compression enabled, the data rate doubles to 3 MB per second per drive, and the total capacity is increased to 2.08 terabytes.

Contact Parity Systems, phone: (800) 514-4080 or (408) 378-1000, e-mail: inquire@parity.com.

Java Components

KL Group Inc. has announced JClass Table and JClass Table Applet, which combine XRT/table functionality with advanced Java technology. JClass Table helps Java developers build large, sophisticated tables and forms, with hundreds of features such as multiple-font and multiple-color cells, cells containing images or other controls, spanning cells, custom user-interactions, and on-demand cell data.

JClass Table Applet is designed for anyone building HTML pages. The Table Applet lets users add sophisticated scrolling tables to Web pages with efficient in-place scrolling, user-adjustable cells, and built-in search/sort. It is priced at $99. JClass Table is designed for Java developers. The Table class library lets Java developers build interactive applications with editable cells, forms, and huge scrolling tables. It is priced at $999.

JClass Table and JClass Table Applet will be distributed via KL Group's Web site, located at *http://www.klg.com.*

Contact KL Group, phone: (800) 663-4723 or (416) 594-1026, fax: (416) 594-1919, e-mail: info@klg.com.

Software-Based Encryption

FSA Corporation has introduced CipherLink, a flexible and full-featured software-based network encryption system. CipherLink transparently encrypts traffic on Windows, Macintosh, and UNIX computer networks with powerful industry-standard encryption algorithms such as DES or Triple DES. As a result, only legitimate users will see the decrypted information.

CipherLink software is priced at $99 per machine with volume discounts for large users. It is currently available for

networks using TCP/IP protocols. Future releases will support Netware, SNA, and LAT protocols.

CipherLink for Windows 3.1, Windows 95, Windows NT, and Macintosh is a drop-in system that operates as a dynamic link library that intercepts calls between the user's applications and the network's TCP/IP stack.

CipherLink for UNIX operates similarly but comes with ready-to-run encryption-enabled versions of all standard network applications. Non-standard UNIX applications can be modified to accept encryption. CipherLink currently runs on HP-UX and other UNIX platforms.

Contact FSA, phone: (403) 264-4822, e-mail: info@fsa.ca, http://www.cipherlink.com.

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CIRCLE 180 ON READER SERVICE CARD

Desktop Faxing

Siren Software has announced Siren Fax 3.0 for Microsoft Windows 95, NT, and Macintosh systems. Siren Fax is a client-server solution for sending and receiving faxes through a group of shared modems on a UNIX server running Siren Fax Server software. Users can create fax "jobs" that include a cover sheet and one or more documents from applications such as Lotus 1-2-3 and Microsoft Word. Users can also fax to one or more recipients. Siren Fax maintains the confidentiality of incoming faxes and delivers them to users' desktop displays; support for Direct Inward Dialing (DID) ensures fax delivery directly to the recipient.

From their Siren Fax clients, users can easily query the server for the status of their outgoing faxes, check for incoming faxes, and view the history of completed faxes in user-defined intervals.

Siren Fax Clients for Microsoft Windows 95, NT, and Macintosh will be available for $100 per user. Siren Fax Server is available for the HP 9000 and other UNIX platforms for $2,895. The Siren Fax Client for Windows 3.1 is $100 per user, and the X-Windows/Motif user agent is $195 per user.

Contact Siren Software, phone: (800) 45-SIREN or (415) 322-0600, fax: (415) 322-9999, e-mail: info@siren.com.

Electronic Commerce

Momentum Systems Limited has announced F-MAIL, software designed for secure, automated file transfers using the industry-standard TCP/IP FTP.

F-MAIL is an application that enables a UNIX-based FTP to support automated mailbox services, including scheduled delivery and retrieval. Using F-MAIL instead of SMTP e-mail for electronic commerce exchanges has several advantages, the company notes: it allows the transfer of nontext data such as EDI without special MIME encoding/decoding; direct transfers confirm each delivery; it supports security call back; mailbox files are securely stored on the server until requested; it allows delivery and retrieval on a scheduled basis; and it is completely automated and can be driven from any application.

The F-MAIL product is available in both server and client versions.

Contact Momentum Systems, phone: (609) 727-0777, fax: (609) 273-3765.

ATM Networking Adapters

Interphase Corporation has announced the signing of an agreement with HP to supply ATM networking adapters for HP 9000 enterprise servers. According to the agreement, HP will use Interphase ATM adapters in HP 9000 enterprise systems using the HP-PB (Precision Bus) I/O architecture.

The adapters supplied to HP by Interphase use a DMA bus master architecture, which provides a sustained 16-

Performance Management

Aurora Software Inc. has announced Version 2 of SarCheck, a performance management tool designed to assist the system administrator in the analysis of a UNIX system's performance by translating *sar* reports into plain English. SarCheck identifies performance bottlenecks, recommends specific parameter and hardware configuration changes, and quantifies the amount of remaining system capacity.

SarCheck explains resource utilization in plain English. Reports contain recommendations that can be used to improve system performance, such as tuning kernel parameters, balancing disk load, and increasing memory size or CPU speed; an analysis of all system resources monitored by SarCheck; and capacity planning information, which uses *sar* data to approximate how large an increase in workload a system can support.

A single SarCheck license for HP-UX begins at $600; other licensing options are available.

Contact Aurora Software, phone: (603) 382-4200, fax: (603) 382-4247, e-mail: 74013.1625@compuserve.com.

MB data rate across the Precision Bus for maximized performance. In addition, 2-MB onboard buffer memory accommodates intermediate bus latencies, and a fully write-posted interface provides improved Precision Bus usage.

By using HP's own Precision Bus interface chip in the design of the adapters, Interphase is able to ensure the best compatibility and performance with HP 9000 platforms, the company notes.

The HP-PB ATM adapter is supported by HP.

Contact Interphase Corporation, phone: (847) 291-1616, fax: (847) 291-1758, http://www.iphase.com.

Open EDI

VeriSign and Premenos Corporation have announced a strategic alliance to facilitate Open EDI (electronic data interchange) over the Internet. Digital IDs, issued by VeriSign, provide proof of identify so that EDI users do not need a pre-established trading partner agreement in order to do business.

The service will allow companies to rapidly deploy these EDI-specific digital authentication services to their trading partner communities who elect to use the Templar's open, standards based, public/private key encryption technology and the Internet.

Today Templar generates private/public key pairs and distributes the public key to trading partners who have previously agreed to trade over the Internet. Companies can then trade with other companies known to them. The joint effort with VeriSign will allow any company or association doing EDI to obtain a x509 v.3 digital certificate that will bind the EDI name with the public key. Certified companies can then trade with companies new to them, yet be assured of the identity of the new trading partner without the traditional trading partner agreement.

Contact Premenos, phone: (510) 602-2000, http://www.premenos.com.

ERP Manufacturing

ESI/Technologies has announced the release of eMIS (Enterprise Management Information System)/2000 for Windows. The integrated suite of 48 manufacturing, financial, and distribution subsystems is completely written using the Oracle Designer/2000 and Developer/2000 toolset.

eMIS/2000 delivers numerous major features and enhancements through the use of CASE. The application leverages the Oracle designer/2000 design and modeling technology to facilitate rapid customization, seamless revisions, and mission-critical implementation of business applications. eMIS/2000 combines a superior GUI with power and high-end functionality; the system is designed to be intuitive and easy to use at all operational levels. The application is based upon open systems and client-server architecture.

Contact ESI/Technologies, phone: (716) 852-8000, fax: (716) 845-5301, http://www.esitech.com.

Object-Oriented Process Management

IDE has introduced tools that tightly link a wide range of process management capabilities—including business process modeling and popular project management methods—directly with an object-oriented analysis and design (OOA&D) tool suite. The new PC-based tools, Enterprise Analyst and Object Analyst, are fully integrated with IDE's StP/OMT-Booch OOA&D toolset, and are aimed at addressing OO development problems caused by lack of collaboration among business analysts, project managers, and developers.

Enterprise Analyst integrates process management tools with the actual implementation tools to provide a basis for feedback, integrated reporting, and overall communication and collaboration among business, project, and development managers. The toolset also includes links to PowerBuilder and Visual Basic to include rapid prototyping in its cohesive approach to automating the entire front end of OO software development lifecycles—from process

modeling all the way through analysis, design, and code generation.

Enterprise Analyst is priced at $4,500 and Object Analyst is priced at $1,500. Value-priced bundles with the StP on UNIX products are also available.

Contact IDE, phone: (800) 888-4331 or (415) 543-0900, fax: (415) 543-0145.

Inter-Process Communication

Thomson Software Products has announced Talkinx, a development environment for building applications that require inter-process communication such as client-server, peer-to-peer, and three-tier. Talkinx is easy to use and runs on multiple platforms, including UNIX and Windows.

Talkinx supports distributed three-tier applications with an easy-to-use six-function API and is accompanied by an object library that links to the application at build time. This functionality gives developers a streamlined approach for taking advantage of distributed computing prior to fully implementing CORBA technologies.

GUI events are generated asynchronously, eliminating wasteful polling by applications. Talkinx also supports other native GUI builders for X and Motif.

Priced at $2,995, Talkinx is currently available on most UNIX platforms, including HP-UX.

Contact Thomson Software Products, phone: (619) 457-2700, fax: (619) 452-2117.

New from UniPress Software

Terminal Emulator

UniPress Software, Inc. has announced PowerTerm. With a range of emulations (VT420, 320, 220, 100, 52, SCO-ANSI, Wyse 50/60, tvi925, tvi950, AT386, DG/MV D-412, AIXterm, IBM 3270—with TCP/IP extensions and IBM 5250), PowerTerm empowers PC users to gain access to the UNIX, VMS, and mainframe information over a network or a modem.

PowerTerm also includes support for televideo devices. With the addition of the 3270 extensions, PowerTerm 3270 now communicates with SNA over TCP/IP and allows functions such as printing, SSCP-LU and LU-LU session control, and handling of system request and attention keys.

The free version of PowerTerm is available on the Internet via ftp at *ftp.unipress.com* in the */pub/free_evals* directory or on the Web at *http://www.unipress.com/free_evals*. A disk is available for a $20 media and shipping/handling charge. This full-featured trial version times out, at which time users can upgrade to purchase.

PowerTerm 320 (the product for connecting to UNIX) lists for $99. PowerTerm 420 (for VMS), PowerTerm 3270, and PowerTerm 5250 list for $199 each and include the right to a Newt TCP/IP stack. PowerTerm InterConnect (including all emulations and the Newt TCP/IP stack) lists for $299.

Web Tools

UniPress Software, Inc. has announced the NetSmiths Toolkit, a collection of software tools for the World Wide Web. The most current versions of the software programs needed to quickly set up and maintain a Web site are compiled and ready to run on seven different UNIX platforms (including HP-UX), as well as PCs and Macs, with updates and new releases made available on the NetSmiths Web site.

The NetSmiths Toolkit, a CD priced at $69, contains a complete set of valuable freeware and shareware that is available on the Internet but is not easy to find or ready to run when downloaded

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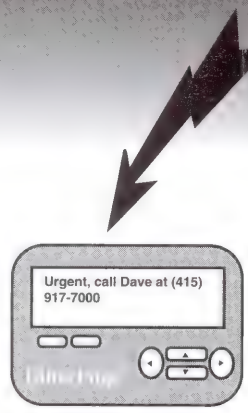

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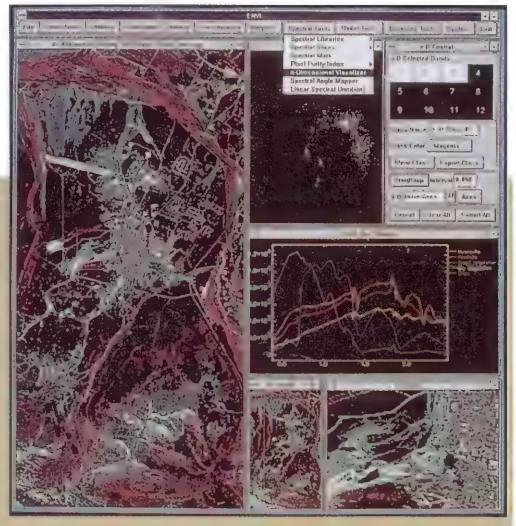

Research Systems, Inc.
ENVI Version 2.5

Image Processing Software

Research Systems, Inc. (RSI) has announced Version 2.5 of its ENVI image processing software. ENVI 2.5 has been endorsed by RADARSAT International, the Canadian firm that developed and launched the RADARSAT earth observation satellite in 1995. RADARSAT endorsement means that ENVI 2.5 has been exhaustively tested and is fully capable of reading and manipulating data collected by the RADARSAT satellite.

ENVI (Environment for Visualizing Images) is an image processing application for technical professionals analyzing remote sensing data. ENVI includes traditional image processing tools and numerous RADAR, spectral analysis, and file handling tools for natural resource, environmental, and agricultural remote sensing. It can be used to visualize and analyze any type of satellite or aircraft digital imagery.

ENVI is written entirely in IDL (Interactive Data Language), Research Systems' fourth-generation language for building data analysis and data visualization applications.

Version 2.5's major new features include state plane projections to support GIS users, ability to add customized annotation to images, new input and output file formats, and the ability to merge data from different sources.

ENVI 2.5 is available for Windows, Macintosh, UNIX, and Linux systems. Personal computer pricing starts at $3,350, and workstation pricing starts at $5,750.

Contact Research Systems, phone: (303) 786-9900, fax: (303) 786-9909, http://www.rsinc.com.

directly off the Internet. The disk also contains various PC and Mac programs. The binaries contained on the CD are the most current versions available, compiled and updated continuously. Purchase of the CD entitles users to a free six-month subscription to the NetSmiths Web site, *http//toolkit.netsmiths.com*, for access to the most current versions of all the software.

Contact UniPress Software, phone: (800) 222-0550 or (908) 287-2100, e-mail: info@unipress.com.

Multiple-Platform Scheduler

New Dimension Software has announced two new modules for its CONTROL-M production control and scheduling software. CONTROL-M/Analyzer and CONTROL-M/Links are based on the company's data integrity solution and automated operations solution, respectively.

CONTROL-M/Analyzer, an automated production setup and analysis tool, allows users to quickly and effectively implement predefined rules to guide the production process. CONTROL-M/Analyzer invokes rules at any point during the production process to analyze the output of application jobs, verifying the accuracy of the run results.

CONTROL-M/Links is a comprehensive automation tool designed to integrate elements of the operations environment into the production schedule. It eliminates the need for manual intervention or programming and provides production administrators with control over all facets of the production environment. CONTROL-M/Links gathers data on any number of conditions.

Prices for the CONTROL-M/Analyzer module and CONTROL-M/Links module each start at $7,500. CONTROL-M scheduler prices start at $20,995 and include the Enterprise Controlstation.

Contact New Dimension Software, phone: (800) 347-4694, ext. 522 (North America), or 972-3-645-1111 (Tel Aviv), http://www.ndsoft.com.

Accounting and Personnel Applications

SOTAS International has announced Accountable Solutions/CS accounting and personnel suites, as well as dedicated integration modules.

The SOTAS Server RDBMS module allows the SOTAS data to be stored and retrieved from a relational database instead of indexed files. SOTAS Client is a GUI module developed using the Cognos Axiant tool and acts as a "thin client."

SOTAS Business Reporter integrates powerful selection and filtration capability of Cognos Impromptu with SOTAS financial report templates and extracts. This allows the user to quickly create presentation-quality reports and forms.

SOTAS Business Analyzer integrates the powerful graphical and drill-down

capabilities of Cognos PowerPlay with SOTAS database structures.

Accountable Solutions/CS is priced from $25,000 per module.

Contact SOTAS, phone: (508) 372-0770, e-mail: sotas@sotasint.com, http://www.sotas.com.

Storage Management

Legato Systems, Inc. has announced four new product and marketing initiatives with HP. These include NetWorker support for the recently introduced HP DLT library, a new HP MPE/iX NetWorker client module, plans to achieve HP OpenView Premier Partner status, and a worldwide service support agreement.

HP's storage peripheral products launched by its General Systems Division combine HP's robotics technology with DLT4000 drives, and the tape libraries are capable of storing up to 2 terabytes of information. When HP commences customer shipments in August, NetWorker will support these libraries on the HP 9000.

With the future NetWorker MPE/iX client module, HP customers will have available a single comprehensive storage management solution that supports all their commonly used operating systems, including HP-UX, MPE/iX, NetWare, and Windows NT. The module is the result of a joint development effort by both HP and Legato.

Contact Legato Systems, phone: (415) 812-6112, fax: (415) 812-6032, http://www.legato.com.

Object-Oriented Development

Tower Technology Corporation has announced TowerEiffel Release 2.0, for building reusable frameworks, applications, and systems. TowerEiffel 2.0 provides commercialized support for the Eiffel programming language and includes an integrated development environment and tools, state-of-the-art compilation technology, and reusable libraries for GUI, database interface, data structures, and distributed processing support. The Professional Version is targeted at software developers of commercial systems. "TowerEiffel Lite" is for individuals who are studying, experimenting, and/or evaluating object-oriented system designs and programming. Source code is 100 percent compatible between the two versions.

TowerEiffel 2.0 Lite is $325 per user on all platforms. The Professional version of TowerEiffel is $995 for Windows NT/95 and Linux, and $1,995 for UNIX platforms, including HP-UX. There are no run-time fees. The Lite version can be upgraded to the Professional version within 6 months of purchase for 100 percent credit.

Contact Tower Technology phone: (512) 452-9455, fax: (512) 452-1721, e-mail: tower@twr.com.

Attention vendors: New product announcements should be sent to New Products Editor, hp-ux/usr *magazine, Interex, P.O. Box 3439, Sunnyvale, California 94088-3439, USA, or e-mail:* pollace@interex.org.

Deadline for submission is two months prior to publication.

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hp-ux/resource directory

The *hp-ux/resource directory* is a complete resource guide for HP-UX users seeking answers. This is one of the industry's most extensive reference guides for HP-UX products, services, and vendors. It will be devoted entirely to HP 9000 users operating in multi-user, workstation, and multi-system UNIX environments. This bi-annual directory, published each year in March and September, is a separate publication mailed out with *hp-ux/usr* magazine, the only HP-specific publication on the market.

Added BONUS: your message will reach your customers for one full year on the *Internet.* Look for the directory on the Interex home page http://www.interex.org. The investment for a full year listing in the *hp-ux/resource directory* is $475.

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Communications
Communications Servers
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Consulting/Systems Integration
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Data Center Management
Data Migration Tool
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Disaster Recovery
Distributed Computing
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Mass Storage
Mass Storage Peripherals
Math Library
Memory
Memory Upgrades
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Migration Tools
Modular Mass Storage
Multimedia
Network Backup Software
Networking
Networking Systems
Network Management
Output Management
Payroll
PC Card Reader
PC Compatibility
PC Integration
Performance
Performance Software
Personal Information Manager
Personnel Management
Pointing Devices
Power Protection & Conditioning
Print Management
Print Management Software
Process Control Software
Production Planning
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Programmer's Editor
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- **Information Access**—full text search and downloading capabilities for all Interex publications including: *hp-ux/usr, Interact,* Vendor Resource Directories, product news and announcements, and Conference Proceedings abstracts.
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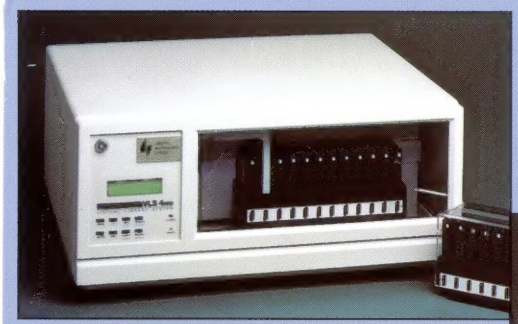

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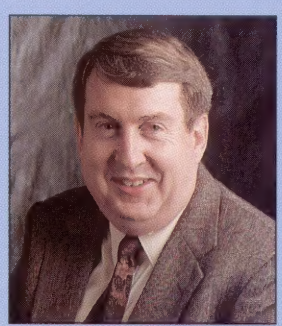

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